BLM-AK-ES-89-001-3809-918

BEAVER CREEK

Placer Mining

Final Cumulative

ENVIRONMENTAL IMPACT STATEMENT

Department of the Interior
Bureau of Land Management
Alaska State Office
1988

ENVIRONMENTAL IMPACT STATEMENT

Draft Cumulative ( ) Final (XX)

BEAVER CREEK
ALASKA STATE OFFICE
ANCHORAGE, ALASKA

Lead Agency: U.S. Department of the Interior

Cooperating Agency: U.S. Army Corps of Engineers, Alaska District

Type of Action: Administrative (XX) Legislative ( )

ABSTRACT

This Final Environmental Impact Statement assesses the cumulative impacts of placer mining on the Beaver Creek watershed as required by the U.S. District Court (District of Alaska) memorandum and order dated May 14, 1987, as amended, in Civil Case A86-083. A Proposed Action and four alternatives incorporating management options ranging from emphasizing regulation under 43 CFR 3809 to a "no mining" alternative as outlined by the Court are presented. The environmental consequences of all the alternatives are analyzed and presented.

For further information about this environmental impact statement, you may contact:

Michael J. Penfold
Attention: Richard Dworsky, Project Manager
Bureau of Land Management
Alaska State Office
701 C Street, Box 13
Anchorage, Alaska 99513
Telephone: (907) 271-3114

ERRATA

The following responses to public comments replace the response, or the indicated portion of a response, contained in the text.

21-20 See text in Section 4.4 and Figure E-1. Roads, trails, and camps are included in Figure E-1, "Construction."

23-20 This response remains as written, except the reference in the last sentence to Figure 2-8 should be to Figure B-1.

24-10 The requested addition has been made; see page S-2.

24-30 See response 24-28.

24-31 Figure 2-7 has been revised. Appendix E-1 emphasizes that the sediment load model does not provide absolute values for the Beaver Creek watershed; rather, the model facilitates relative comparisons among the alternatives.

24-32 Figure 2-7 has been revised to show relative comparisons only. Figure E-1 disaggregates the sources of projected sediment loads. The sediment load model does not assume "zero discharge" as a performance standard.

24-33 Neither page 4-11 nor Figure 4-1 *(in the draft EIS)* present any worst case information or analysis on sediment loading. The estimated sediment loading rates do not consider enforcement actions; however, the analysis in Section 4.4 assumes that water quality performance standards are met.

25-6 Figure 1-2 has been revised and is now located on page S-2.

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
ALASKA STATE OFFICE
701 C STREET, BOX 13
ANCHORAGE, ALASKA 99513-0099

TAKE PRIDE IN AMERICA

Dear Reader:

Enclosed for your review is the Final Environmental Impact Statement (EIS) for placer mining within the Beaver Creek watershed. This EIS was prepared in response to a U.S. District Court (District of Alaska) Civil Case A86-083 filed on May 14, 1987, as amended, which ordered the Bureau of Land Management (BLM) to prepare an EIS for the Birch Creek watershed, and required an evaluation of the need for an EIS on the Fortymile River, Minto Flats, and Beaver Creek watersheds.

A draft EIS was filed with the Environmental Protection Agency in April, 1988. The public was given 60 days to comment on the draft. Forty-three comments were received before the end of the comment period. In response to comments, we have supplemented and modified the analysis of environmental consequences and made factual corrections. The Proposed Action in the Final EIS adopts some of the performance standards analyzed for Alternative C in the Draft EIS. All comments on the draft and final EISs will be considered in the decision making process.

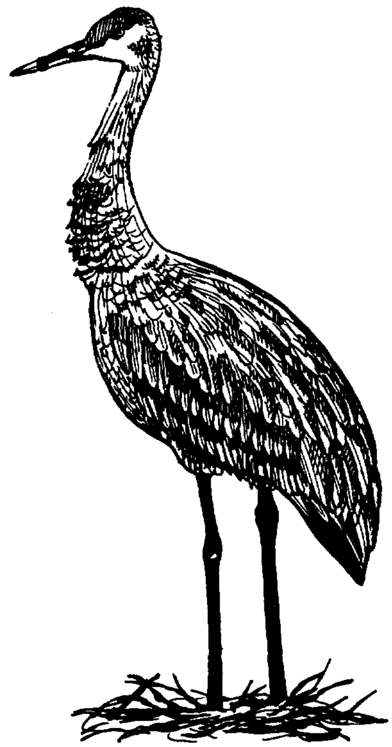
I want to thank those of you who have provided suggestions and comments throughout this EIS process. Your help has been invaluable in the development and analysis of these alternatives.

Sincerely yours,

State Director

Summary

Introduction



Sandhill Crane

A United States District Court for the District of Alaska Memorandum and Order (A86-083 Civil) filed on May 14, 1987, instructed the Bureau of Land Management (BLM) to cease approving Plans of Operations for federal placer mines after October 1, 1987, in the Birch Creek watershed pending completion of an adequate cumulative effect Environmental Impact Statement (EIS). On May 28, 1987, injunctions followed covering the watersheds of Beaver Creek, the Fortymile River, and Minto Flats (which is comprised of the Chatanika River, Tolovana River, and Goldstream Creek). On July 22, 1987, the Court issued an amendment to the May 14 and May 28 orders, extending the date of cessation to the November 15, 1987.

This final EIS analyzes the cumulative impacts of placer mining on the Beaver Creek watershed, as directed by the District Court in the Sierra Club lawsuit.

Objectives

There are two primary objectives of this EIS. The first is to identify and consider performance standards under which placer mining may be conducted on federal lands in the area. The second is to comply with the Court Orders and to conduct evaluations and prepare the associated documents under the National Environmental Policy Act (NEPA) and the Alaska National Interest Lands Conservation Act (ANILCA) subsistence requirements (found in Section 810 of ANILCA).

Cumulative Impacts

At issue are the cumulative impacts of multiple mining operations on the environment. Initially under these injunctions, only Plans of Operations on federal claims were affected. Mines operating under Notices (operations disturbing five acres or less) were not affected; however, the impacts of such mines must be included in the evaluations. A subsequent court order of November 6, 1987, requires a Plan for all operations regardless of size, on land withdrawn from mineral entry, with a one-year exception for those mines operating in 1987. The order of November 6, 1987, as well as prior injunctions have now been affirmed on appeal (Sierra Club v Penfold, Nos. 87-3597, 87-4094, 87-4132, 87-4209 (9th Circuit, September 21, 1988)).

Relationship to Other NEPA Documents

This EIS will be an overarching environmental document from which more site-specific environmental assessments can be tiered. Tiering is an interrelationship in which reference from a more general NEPA document such as this EIS can be made to a more specific one, thus avoiding duplication. A more specific environmental assessment will not change or modify decisions resulting from this analysis, but will, on a case-by-case basis, identify more detailed and site-specific impacts and actions and mitigation measures to reduce environmental impacts. The U.S. Army Corps of Engineers could also tier site-specific environmental assessments of proposed placer mining to this EIS.

The figure below illustrates some of the different guidelines and responsibilities of BLM, other federal agencies, and the State of Alaska in managing placer mining on the public lands.

Agency	Legal Guidelines & Plans for Management	Responsibility of Agency	Enforcement Responsibility of Agency
BLM	Resource Management Plan 43 CFR 3809 regulations	Surface management	Due and necessary mining action
EPA	Section 401 of Clean Water Act	Water quality	Water standards
Corps	Clean Water Act	Fill materials in waters and wetlands	Terms and conditions of DA permits
State of Alaska	AS 16.10.840 AS 16.05.870 AS 46 and 18 AAC 30, 31, 50, 60, 62, 64, 70-72, 75, 80	Fish Passage Anadromous Fish Air, Land and Water Quality	State standards

General responsibilities of applicable agencies concerning placer mining. This table applies to State, federal and private mines. BLM evaluates the cumulative impacts of all mines, but can only manage within its jurisidiction.

Applicable Laws

BLM manages mining under the General Mining Law of 1872, 30 U.S.C. 22 et seq., as amended, and the Federal Land Policy and Management Act (FLPMA) of 1976, 43 U.S.C. 1701 et seq. The 1872 Mining Law provides for the exploration, development, production, and purchase of mineral resources of the public lands, as well as the right of reasonable access to mining claims.

Location

The Beaver Creek watershed is located approximately 50 air miles north of Fairbanks and encompasses nearly 1.2 million acres of land. Most of the upper portion of the drainage lies within the White Mountains National Recreation Area. This EIS focuses on the portion of the Beaver Creek

watershed which drains into the Beaver Creek National Wild River corridor. A map entitled "Area Map" depicting major features, one entitled "Status" showing land status, and the "Tributaries and Main Physical Features Map" can be found in Chapter One.

Public and Agency Participation

As required by NEPA regulations, BLM used an open process to gather public input. To this end, a Notice of Intent to prepare environmental impact statements was published in the Federal Register on August 18, 1987, and in local newspapers in late August 1987. BLM also conducted a series of public meetings in locations throughout the affected area between July and September 1987. At the same time, more than 450 notices of the public meetings were sent out to miners, environmentalists, native groups, and other members of the public. The BLM also invited participation from other government agencies, private organizations, the placer mining industry, and any other concerned individuals. At the scoping meetings a description of the EIS process and the proposed activity was provided by the appropriate BLM District Manager. The meetings were then opened to members of the public to voice their concerns and ask any questions about the issues.

Significant issues arising from this input include:

- What are the impacts of placer mining operations on water quality?
- How are water quality standards regulated and enforced and who performs this function?
- What are the impacts of placer mining on terrestrial habitats?
- Have reclamation practices and improved management under the 43 CFR 3809 regulations occurred since 1981?
- What are the impacts of other agency laws and regulations on the placer mining industry?
- What are the impacts of mining on subsistence activities ongoing in the region?

Specific coordination meetings were held with various State of Alaska agencies such as the Department of Natural Resources, Department of Environmental Conservation (ADEC), Department of Fish and Game, and the Office of Management and Budget, Office of the Governor. Meetings were also held with the federal Environmental Protection Agency (EPA), U.S. Army Corps of Engineers (Corps), the National Park Service, U.S. Bureau of Mines, and the U.S. Fish and Wildlife Service.

Management and Evaluation Methods

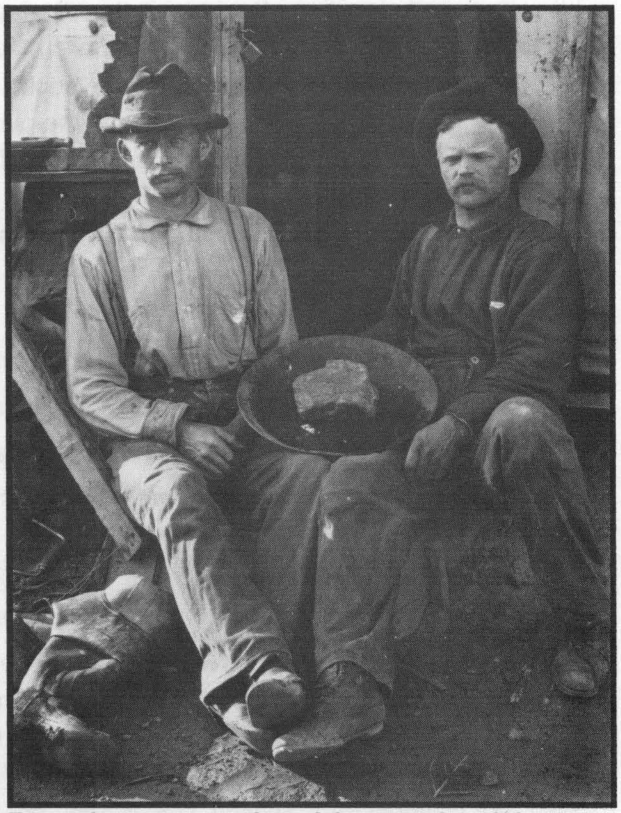
Under the Proposed Action and all of the land management alternatives described in this EIS, the BLM would manage lands under its authority to see that the requirements of 43 CFR 3809 (surface management regulations) are met. Under each alternative, the Corps would regulate the placement of dredged and/or fill material into waters of the United States, including wetlands (33 CFR 320 et seq.). The descriptions for the Proposed Action and each alternative evaluate the cumulative impacts under various administrative conditions and requirements of not only the BLM, but also of the State of Alaska, the EPA, and the Corps.

Summary of Alternatives and Environmental Consequences

The following discussion summarizes the environmental consequences of the alternatives on the human environment. Please consult the appropriate sections of the EIS for additional information and background.

Proposed Action

The Proposed Action for this EIS is to manage mining claims on federal lands according to the BLM Surface Management Regulations in 43 CFR 3809, using State water quality standards with variances as managed by the appropriate agency, and enhanced reclamation. BLM would manage placer mining in the Beaver Creek drainage according to State of Alaska water quality standards with variances. Reclamation would entail stabilization and rehabilitation of soils and stream channels, as well as provision for natural revegetation, enhanced where appropriate.



Record nugget produced from early mining activity. From the "Toni" Troseth collection, courtesy of the Alaska and Polar Regions Department Archives, University of Alaska, Fairbanks.

The water quality performance standards would be the current EPA effluent guidelines and ADEC water quality standards, or the existing EPA/ADEC variance for the operation. The performance standards are 0.2 ml/l of settleable solids, .05 mg/l arsenic, and 5 Nephelometric Turbidity Units (NTU) above natural conditions when natural turbidity is 50 NTU or less, and not more than a 10% increase in the turbidity when the natural turbidity is 50 NTU, not to exceed a maximum increase of 25 NTU at the mine effluent discharge point.

Reclamation under the Proposed Action calls for tailings, ponds, and soils to be stabilized, stream channel to be restored, and natural revegetation enhanced as required to facilitate restoration. Site reclamation would concerned with minimizing non-point source erosion, and could include enhanced attempts to facilitate revegetation.

Consequences of the Proposed Action

In the Proposed Action, the BLM forecasts a total of five mines operating continuously for the next ten years. There should be no significant cumulative impacts on topography or mineral resources. While the soil profile would be completely altered by mining operations on approximately 115 acres, there should be no irreversible or irretrievable commitment of soil materials.

Water quantity would not be significantly affected and water quality would return to approximately natural conditions after successful stabilization of the disturbed area and stream channel. There would be short-term increases in suspended sediment and turbidity, and accelerated local erosion resulting in a possible increase in sediment introduced into the stream system in the vicinity of the disturbed area. These impacts are not expected to be significant downstream in Beaver Creek. The impact on chemical water quality is not expected to be significant.

The vegetation cover would be destroyed in the areas of the mines and roads, resulting in an unavoidable short-term loss of productivity. Twenty-eight acres would regrow to a riparian tall shrub community within 25-30 years of reclamation, and an additional 8.6 acres would regrow within 50 years on mining disturbance in creek bottoms. Sixty-four acres of the 115 acres of new mining disturbance would remain barren or sparsely vegetated after 50 years.

Approximately 676 acres of wildlife habitat would be physically altered due to mining and related activities. The principal long- term adverse effect of mining would be the unavoidable loss of approximately 115 acres of moose winter range habitat for a period of 25-30 years. This long-term cumulative loss of habitat to mining activities in these areas would probably contribute to a minimal reduction in moose population potential. There would be no irreversible or irretrievable commitment of fisheries resources.

Cumulative impacts on cultural and paleontological resources in the Beaver Creek drainage do not appear to be significant, in part because field inventory work in the area has not resulted in the discovery of significant remains. Unanticipated finds, however, could occur during mining, although the likelihood of that happening is low.

The upper portion of the Beaver Creek watershed is not notably used for subsistence purposes now, nor has it been in the recent past. Subsistence activities such as hunting, fishing, and trapping are limited primarily to the lower portions of the drainage, far from the mined areas, with primary participants being residents of Birch Creek village. It is projected that no significant restriction to subsistence uses would occur in the region because water quality and fish resources would not be negatively impacted in areas downstream from mining.

Certain recreational activities would be enhanced due to the access provided by additional mining roads. Visual resources would be reduced slightly in the immediate area by additional roads and mining operations. No mining is expected within the Wild River Corridor.

If the number of mines increased from one to five, direct employment would increase by 38 work months per year and annual wages would increase by an estimated $45,000. Annual costs for each of the five mining operations would be $1,900 for water treatment and $3,400 for reclamation. Administration and enforcement of the Surface Mining Program for placer mining would cost the BLM about $9,000 (all values are in 1987 dollars).

Alternative A

Under this alternative, mining would be regulated according to the BLM Surface Management Regulations in 43 CFR 3809 using the following performance standards.

The water quality performance standards would be the current EPA/ADEC standard of 0.2 ml/l of settleable solids, .05 mg/l arsenic, and 5 NTU turbidity. No water quality variances would be incorporated in this alternative.

Soils would be reshaped, stream channels would be stabilized, and restoration and revegetation would be allowed to proceed by natural processes.

Consequences of Alternative A

The effects of Alternative A are based on four mines operating continuously for the next ten years. The reduction in the number of operating mines is derived from increased compliance costs to meet the water quality performance standards of Alternative A.

Under Alternative A, there should be no significant impacts on topography, mineral resources, and water quality. There would be some short- to long-term adverse increases in suspended sediment and turbidity, and accelerated local erosion, resulting in a possible increase in sediment introduced into the stream system. Water quality would, however, return to approximately natural conditions after successful stabilization of the disturbed area and stream channel. The impact on chemical water quality would not be significant.

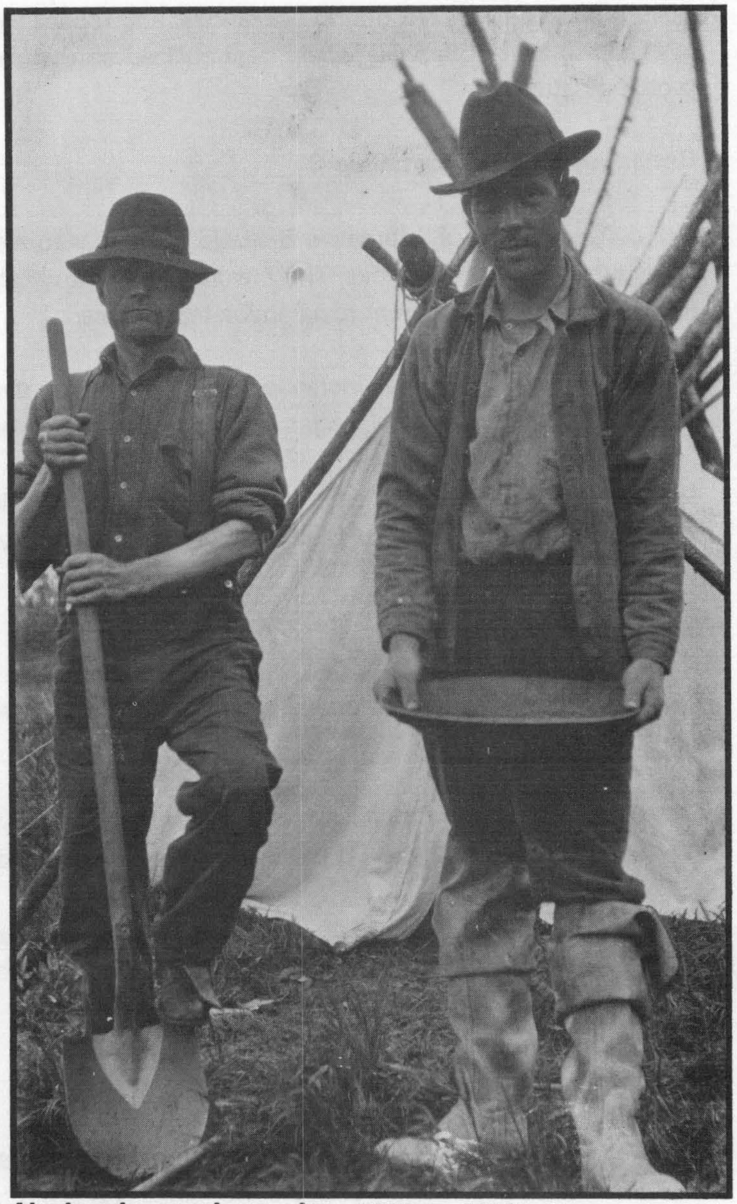
The vegetation cover would be destroyed in the areas of the mines and roads, resulting in an unavoidable short-term loss of productivity. Twelve acres would regrow to a riparian tall shrub community within 30 years of reclamation, and an additional 7.5 acres would regrow within 50 years on mining disturbance in creek bottoms. Eighty acres of new mining disturbance would remain barren or sparsely vegetated for 50 years after mining.

Approximately 634 acres of wildlife habitat would be physically altered due to mining and related activities. The principal long- term adverse effect of mining would be the unavoidable loss of approximately 100 acres of moose winter range habitat for a period of 50 years. This long-term cumulative loss of habitat to mining activities in these areas would probably contribute to a minimal reduction in moose population potential. There would be no irreversible or irretrievable commitment of fisheries resources.

There would not be any significant cumulative impacts to cultural or paleontological resources in the Beaver Creek drainage for reasons noted earlier. Subsistence activities and resources in the lower Beaver Creek watershed would not be significantly restricted by mining also for the same reasons given under the Proposed Action.

Certain recreational activities would be enhanced due to the access provided by additional mining roads. Visual resources would be slightly reduced by the increased road mileage and mining operations. No mining is expected within the Wild and Scenic River Corridor.

If the total number of mines increased from one to four, direct employment would increase by about 30 work months per year and annual wages would increase by an estimated $34,000. Annual costs for each of the four mining operations would be $18,100 for water treatment and $1,000 for reclamation. Administration and enforcement of the Surface Mining Program for placer mining would cost the BLM about $6,000 (all values are in 1987 dollars) total, annually.



Alaska placer miners circa 1928 or 1929. Photo courtesy of the Anchorage Museum of History and Art.

Alternative B

This alternative would combine the standards from 43 CFR 3809 with standards established to meet the management goals of the various Resource Management Plans for the watershed.

Water quality performance standards would be defined by current EPA/ADEC regulations as 0.2 ml/l settleable solids, .05 mg/l arsenic, and 5 NTU turbidity. No water quality variance would be incorporated in this alternative.

Soils would be stabilized during operations, and topsoil would be spread over reshaped stream tailings after mining. Channels would be stabilized so that recovery and revegetation processes could proceed naturally.

Consequences of Alternative B

The consequences of Alternative B would be similar to Alternative A including the effect on subsistence activities and resources. There would be slight variations in regrowth rates and areal extent of revegetation due to different reclamation techniques.

If the total number of mines increased from one to four, direct employment would increase by about 30 work months and annual wages would increase by an estimated $34,000.

Annual reclamation cost for each of the four mining operations would be $2,000. Total administrative and enforcement costs to the BLM would be approximately $9,000 annually.

Alternative C

This alternative would focus on various standards proposed or under discussion by EPA and other agencies.

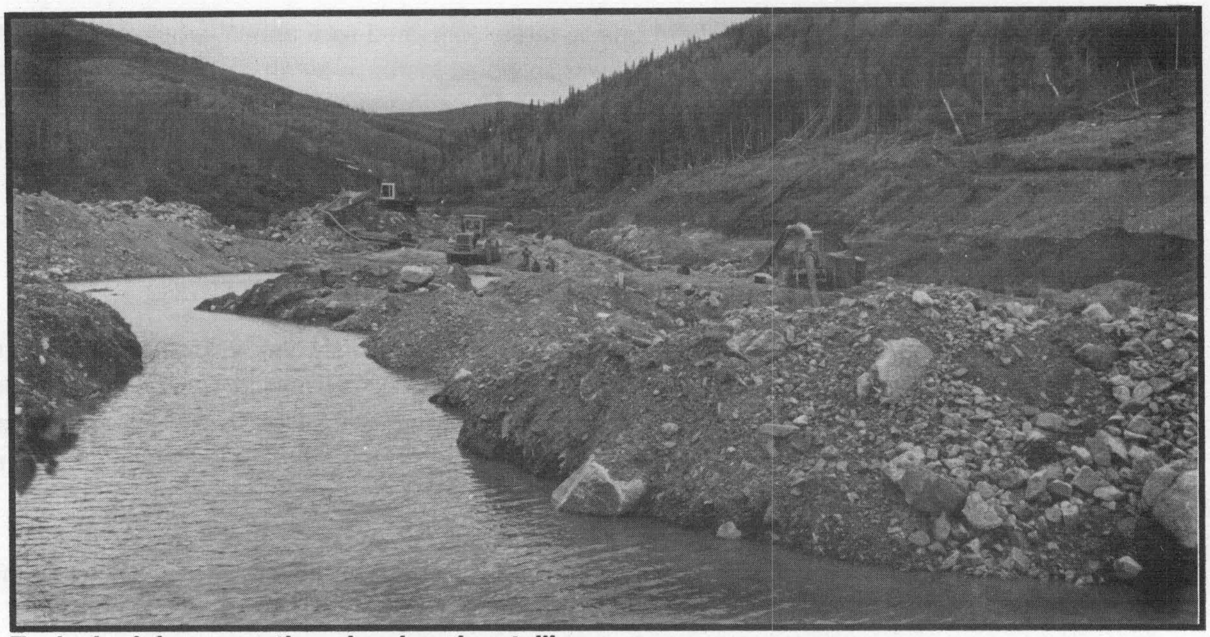
The water quality performance standards for this alternative would be zero ml/l settleable solids, .05 mg/l arsenic, and zero NTU turbidity above natural conditions with no water quality variances.

Reclamation standards would emphasize restoration of natural appearing contours, creek channels, and native vegetation. Mining activities would be conducted to minimize impacts to wetlands and riparian zones.

Consequences of Alternative C

The effects of Alternative C are based on three mines operating continuously for the next ten years. The reduction in the number of operating mines is derived from a significant increase of compliance costs to meet water quality performance standards of Alternative C.

Under Alternative C, there would be no significant impacts on topography, mineral resources, and water quality. There would be some short-term adverse increases in suspended sediment and turbidity, and accelerated local erosion, resulting in a possible increase in sediment introduced into the stream system. These impacts would not be significant downstream on Beaver Creek. The impact on chemical water quality would not be significant.



Typical mining operation showing river tailings. Bureau of Land Management.

The vegetation cover would be destroyed in the areas of the mines and roads, resulting in an unavoidable short-term loss of productivity. Twenty-one acres would regrow to a riparian tall shrub community within 25 years of reclamation, and an additional 16.5 acres would regrow within 50 years on mining disturbance in creek bottoms. Nearly 50 acres of new mining disturbance would remain barren or sparsely vegetated after 50 years.

Approximately 589 acres of wildlife habitat would be physically altered due to mining and related activities. The principal long- term adverse effect of mining would be the unavoidable loss of approximately 100 acres of moose winter range habitat for a 25-35 year period. This long-term cumulative loss of habitat to mining activities in these areas would probably contribute to a minimal reduction in moose population potential. There would be no irreversible or irretrievable commitment of fisheries resources.

There would not be any significant cumulative impacts to cultural or paleontological resources or subsistence activities and resources in the lower Beaver Creek watershed for the same reasons given before for the other alternatives. Subsistence activities and resources in the lower Beaver Creek watershed would not be significantly restricted by mining also for the same reasons given under the Proposed Action.

Visual resources would be slightly reduced by the increased road mileage and mining operations. No mining is expected within the Wild and Scenic River Corridor.

If the total number of mines increased from one to three, estimated total annual employment would increase by about 22 work months and annual wages would increase by an estimated $25,000. Annual costs for each of the three mining operations would be $30,100 for water treatment and $3,400 for reclamation. Administration and enforcement of the Surface Mining Program for placer mining would cost the BLM about $8,000 (all values are in 1987 dollars) annually, total.

Alternative D

This is the "no mining" alternative defined by the District Court in its Memorandum and Order of May 28, 1987, as amended. Under this alternative, no applications for mining claims, under either Plans of Operations or Notices, would be processed or approved by the BLM. Validity examinations would be conducted for each properly recorded federal mining claim, and the owner would be compensated accordingly.

Stabilization of surface disturbance occurring after 1980, would be required on all federal claims, and restoration would be allowed to proceed by natural processes.

Alternative D violates current law (General Mining Law of 1872) and regulations (43 CFR 2091.1 for accepting applications and 43 CFR 3809.1-6 for processing applications) and would therefore require changes in the regulations and statutory law for legal implementation.

Consequences of Alternative D

The effects of Alternative D are based on no further placer mining disturbances in the Beaver Creek watershed. There would be no further impacts upon topographic or water resources. Mineral resource development would cease. No soils would be disturbed further, but non-point erosion from unreclaimed areas may introduce sediment into the stream system.

The vegetation cover destroyed on areas previously mined would result in an unavoidable long-term loss of 300 acres of vegetation resources. Approximately 300 to 320 acres of moose winter range would remain lost because of past physical alterations. There would be no impacts to fisheries resources.

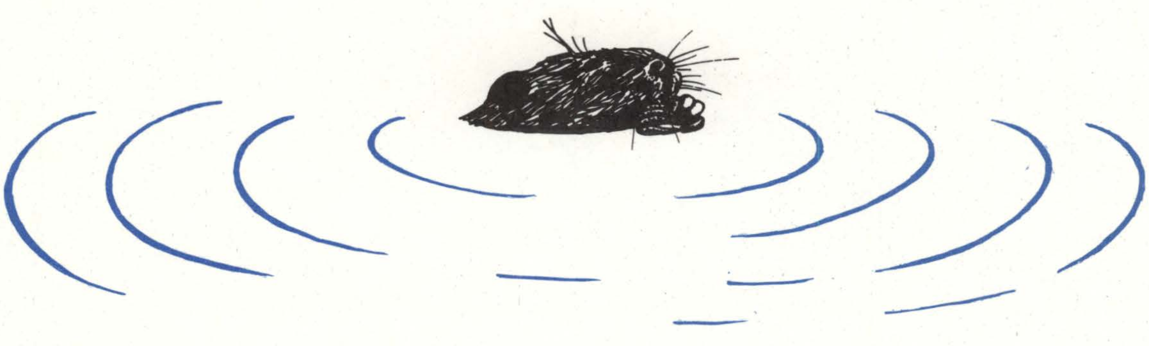
There would be no significant cumulative impacts to subsistence or cultural and paleontological resources due to implementation of this alternative. Visual resources would remain the same as they are today.

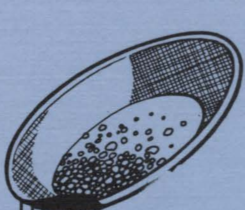
If the only mine in the watershed were to shut down, annual employment would decrease by an estimated eight work months and annual wages would decrease by almost $9,000. Under the no-mining alternative, the federal government would be required to provide compensation for closing down valid federal mining claims. The present net value of the claims is roughly estimated to be between $1.6 million and $44 million. Validity examinations on all properly recorded federal mining claims would cost the BLM approximately $262,000 to complete (all values in 1987 dollars).

BEAVER CREEK

Final
Cumulative

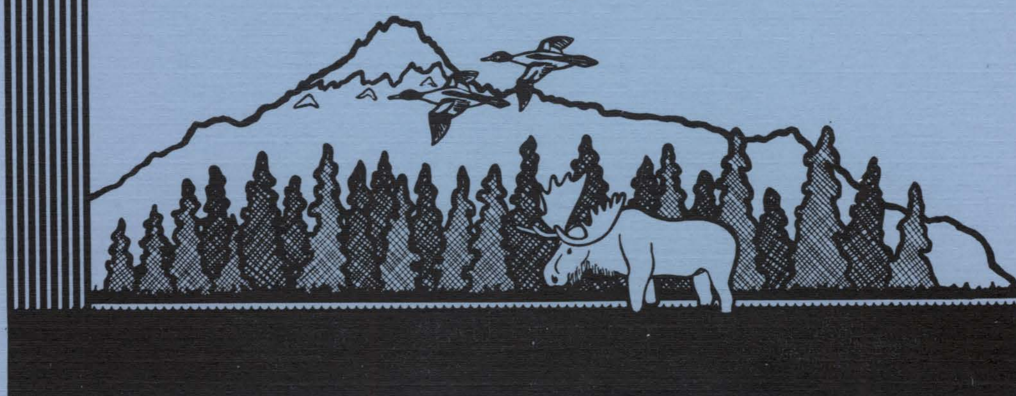
ENVIRONMENTAL IMPACT STATEMENT





Chapter I
Purpose and Need for Action

CHAPTER MAPS



BEAVER CREEK

1.1 Purpose and Need

There are two primary objectives of this Environmental Impact Statement (EIS). The first is to identify and consider performance standards under which placer mining may be conducted on Federal lands in the area, including methods and procedures which will be utilized "...when an activity is being accomplished by a prudent operator in usual, customary, and proficient operations of similar character and taking into consideration the effects of operations on other resources and land uses, including those resources and uses outside the area of operations" (43 CFR 3809.0-5(k)). The second objective is to comply with the Court Orders (described in Section 1.2) to conduct evaluations and prepare the associated documents under the National Environmental Policy Act (NEPA) and the Alaska National Interest Lands Conservation Act (ANILCA) subsistence requirements (ANILCA Section 810). Figure 1-1 identifies the directives from the various court orders and injunctions pertaining to this placer mining EIS, and the products of the EIS process which respond to these directives.

COURT DIRECTIVES	EIS PRODUCTS
1. Identify the degree of environmental harm and benefits.	• Assess cumulative impacts • Consultant studies - e.g. water, fish, and wildlife (Appendix A-1) • Chapter 4
2. Identify the extent that environmental harm can be prevented.	• Identification of alternative actions identified in Chapter 2 and evaluated in Chapter 4 • Mitigating measures-chapter 4 • Record of decision • Management under 43 CFR 3809 EA consultant contract
3. Identify the expense of preventing some or all of the harm.	• Economic study • Chapters 2 and 4 and the Appendix
4. Identify the economic and social benefits and costs of the matter being evaluated.	• Economic study • Subsistence evaluation • Chapter 4
5. Assess cumulative environmental and subsistence impacts.	• Consultant studies including water quality, fish, and aquatic habitats, visual resources and subsistence • Chapters 2 and 4

Figure 1-1. Directives of the District Court Memorandum and the products of the EIS in response.

1.2 Introduction

A United States District Court for the District of Alaska Memorandum and Order (A86-083 Civil) filed on May 14, 1987, instructed the Bureau of Land Management (BLM) to cease approving Plans of Operations for federal placer mines in the Birch Creek watershed after October 1, 1987, pending completion of an adequate cumulative effect Environmental Impact Statement (EIS). On May 28,

1987, injunctions followed which covered the watersheds of Birch Creek, Beaver Creek, the Fortymile River, and Minto Flats (which is comprised of the Chatanika River, Tolovana River, and Goldstream Creek). On July 22, 1987, the Court issued an amendment to the May 14 and May 28 orders, extending the date of cessation to November 15, 1987.

At issue are the impacts of multiple mining operations on the environment, including the cumulative impacts, especially on water, visual, and subsistence resources. Initially, under these injunctions, only Plans of Operations on federal claims were affected. Mines operating under Notices (those disturbing five acres or less) were not affected; however, the impacts of such mines are included in this EIS. A subsequent court order of November 6, 1987, requires Plans of Operations for all operations on claims with valid existing rights, regardless of size, on land withdrawn from mineral entry, with a one-year exception for mines which operated in 1987. For the Corps, the principle issues involve avoiding or minimizing impacts to waters and wetlands.

An EIS describes, for public review and consideration, a proposed federal action that could significantly affect the human environment. In this case, the Court held that cumulative environmental impacts for all placer mining, on State and private, as well as federal lands, should be addressed, in a comprehensive EIS rather than only through the completion of an environmental assessment of each individual mining Plan of Operations.

This EIS is based on the National Environmental Policy Act of 1969 (NEPA) and Council on Environmental Quality (CEQ) regulations. Per CEQ regulations, the BLM used an interdisciplinary team in a systematic approach to analyze the affected area, to estimate the environmental effects, and to write this statement. Where data gaps were identified, the BLM used contract services to collect and analyze additional information. The contractors included the State of Alaska and private consulting firms. A list of the consultant contracts is included in Appendix A-1. A list of the EIS preparers is included in Chapter Five.

This EIS is in itself not a decision document to change the land use classifications established in prior planning documents. However, if the decision is made in the Record of Decision (ROD) to modify existing land use classifications, then plan amendments would be developed. The ROD will, however, define the overarching terms and conditions under which placer mining can be conducted.

Environmental Assessments and Tiering

The regulations in 43 CFR 3809.2-1 require preparation of at least an Environmental Assessment (EA) for the approval of a placer mine Plan of Operations. These EA's will tier off this EIS. Tiering is an interrelationship in which reference to a more general NEPA document such as this EIS can be made in a more specific one, thus avoiding duplication. No Plan of Operations will be approved based solely on this EIS. Also, a more specific environmental assessment will not change or modify decisions resulting from this analysis, but will, on a case-by-case basis, identify more detailed and site-specific actions, their impacts, and mitigation measures to reduce environmental impacts. Tiering can also be used by other agencies, such as the U.S. Army Corps of Engineers (Corps). The

Corps may use this EIS as a generalized document for reviewing work in the watershed under the Alaska Corps regulatory program relative to Section 404 of the Clean Water Act.

During 1987, five Plans of Operations were filed with BLM for mining in the Beaver Creek drainage. However, additional Plans of Operations on the federal mineral estate are anticipated within the next ten years. This document analyzes the cumulative impacts of anticipated future mining activities.

1.3 Background

BLM manages mining under the General Mining Law of 1872, 30 U.S.C. 22 et seq, as amended, and the Federal Land Policy and Management Act (FLPMA) of 1976, 43 U.S.C. 1701, et seq. The 1872 Mining Law provides for the exploration, development, production, and purchase of mineral resources on public lands, as well as the implied or statutory right of access to mining claims.

FLPMA provides that, in managing the public lands, the Secretary of Interior shall take any action required to prevent "unnecessary or undue" degradation of the land. This FLPMA provision is implemented by the Code of Federal Regulations (CFR) section covering surface management (43 CFR 3809). Additionally, specific terms and conditions for placer mining and other land uses are defined in the White Mountains National Recreation Area Resource Management Plan (RMP), and in the Beaver Creek Wild River Management Plan.

The Corps has similar regulatory responsibility under Section 404 of the Clean Water Act; Section 404, applies to the placement of dredged and/or fill material into waters of the United States, including wetlands. Section 404 regulations for the Corps are at 33 CFR 320 et seq.; NEPA implementing procedures for the Corps are at 33 CFR 230 and 325.

Cumulative Impacts

The crux of the present concern is the nature, degree, and extent of the cumulative impacts of mining and related activities on the physical, biological, and socio-economic environment in each of the four watersheds the Court identified. In particular, the cumulative effects and impacts of placer mining need to be clearly explained and fully analyzed. The CEQ regulations at 40 CFR 1508.7 define cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless, of what agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time."

Because of uncertainty surrounding the number of mines that may operate in the reasonably foreseeable future, a methodology was established by forecasting the price of gold in the future and the number of mines that BLM might expect to operate in the next ten years. Although it is believed to be highly unlikely, a worst case scenario was developed and analyzed.

1.4 Geographic Setting and Land Status

The Beaver Creek watershed is located approximately 50 air miles north of Fairbanks and encompasses nearly 1.2 million acres of land. The headwaters and most of the drainage lies within the White Mountain National Recreation Area (WMNRA). This EIS will focus on the portion of the Beaver Creek watershed which drains into the Beaver Creek National Wild River corridor. The Area Map in this chapter shows major features, the Status Map in this chapter depicts the land status, and the Tributaries and Main Physical Features Map (the foldout in this chapter) shows the area in greater detail. The majority of the watershed lies within the Yukon-Tanana Uplands physiographic province, which consists of rounded hills around a high central area of rugged mountains (Selkregg 1974). The province is bounded on the north by the Yukon River and on the south by the Tanana River.

The highest point in the study area is Mount Prindle (5,286 feet above sea level), located on the eastern border of the drainage. Other peaks of note are Rocky Mountain, also known as Lime Peak (5,082 feet), to the north of Mount Prindle; Cache Mountain (4,772 feet), near the center of the study area; and Wickersham Dome (3,207 feet), in the southwest corner of the WMNRA. The lowest point in the study area, approximately 600 feet, is in the Yukon Flats on the northern boundary.

Beaver Creek itself is formed at the confluence of Champion and Bear Creeks, which flow from Mount Prindle in the southeast portion of the study area. Other tributaries include Nome, Quartz, Colorado, Trail, Wickersham, Fossil, O'Brien, and Victoria Creeks. The approximate length of Beaver Creek is 303 miles from its headwaters on Mount Prindle to its mouth at the Yukon River near the village of Beaver. (The uppermost 127 miles of Beaver Creek are in the study area).

The climate of the Beaver Creek area is fairly typical of Interior Alaska with cold, dry winters and warm, but short, summers. The mean January temperature is -10° to -20° F and the mean July temperature is about 70° F, although temperatures can dip as low as -70° F during some winters and reach as high as 95° F during some summers. Precipitation averages 11 inches per year, including 70 inches of snow which falls during the autumn, winter, and spring.

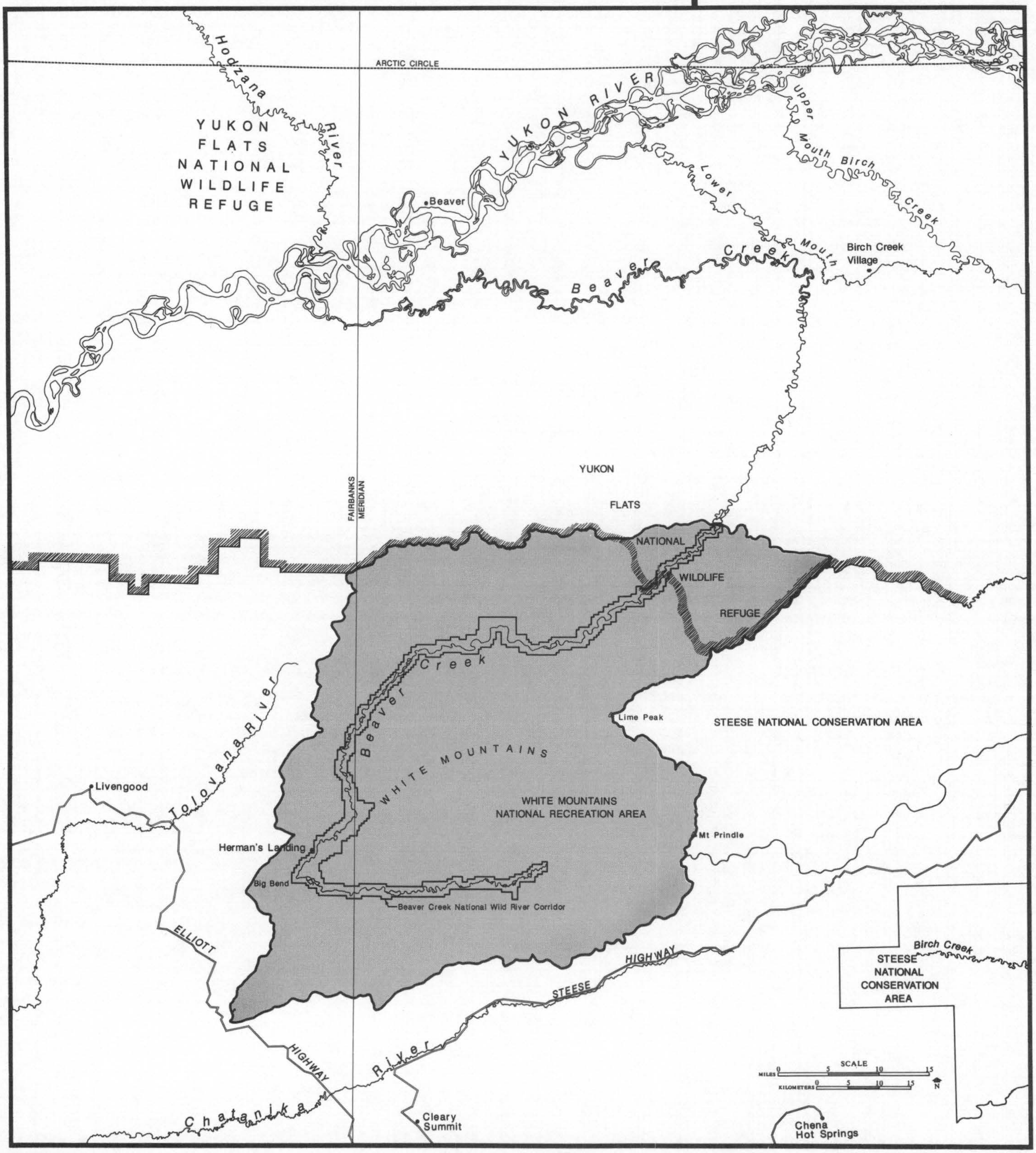
Management

The lands in the Beaver Creek watershed are predominantly managed by BLM as the White Mountains National Recreation Area. The northeast portion of the watershed is located within the Yukon Flats National Wildlife Refuge, which is managed by the U.S. Fish and Wildlife Service.

The BLM lands are managed in accordance with the provisions of the River Management Plan for Beaver Creek, a National Wild River, and by the RMP for the White Mountains National Recreation Area.

Beaver Creek FINAL Cumulative Environmental Impact Statement

Area Map



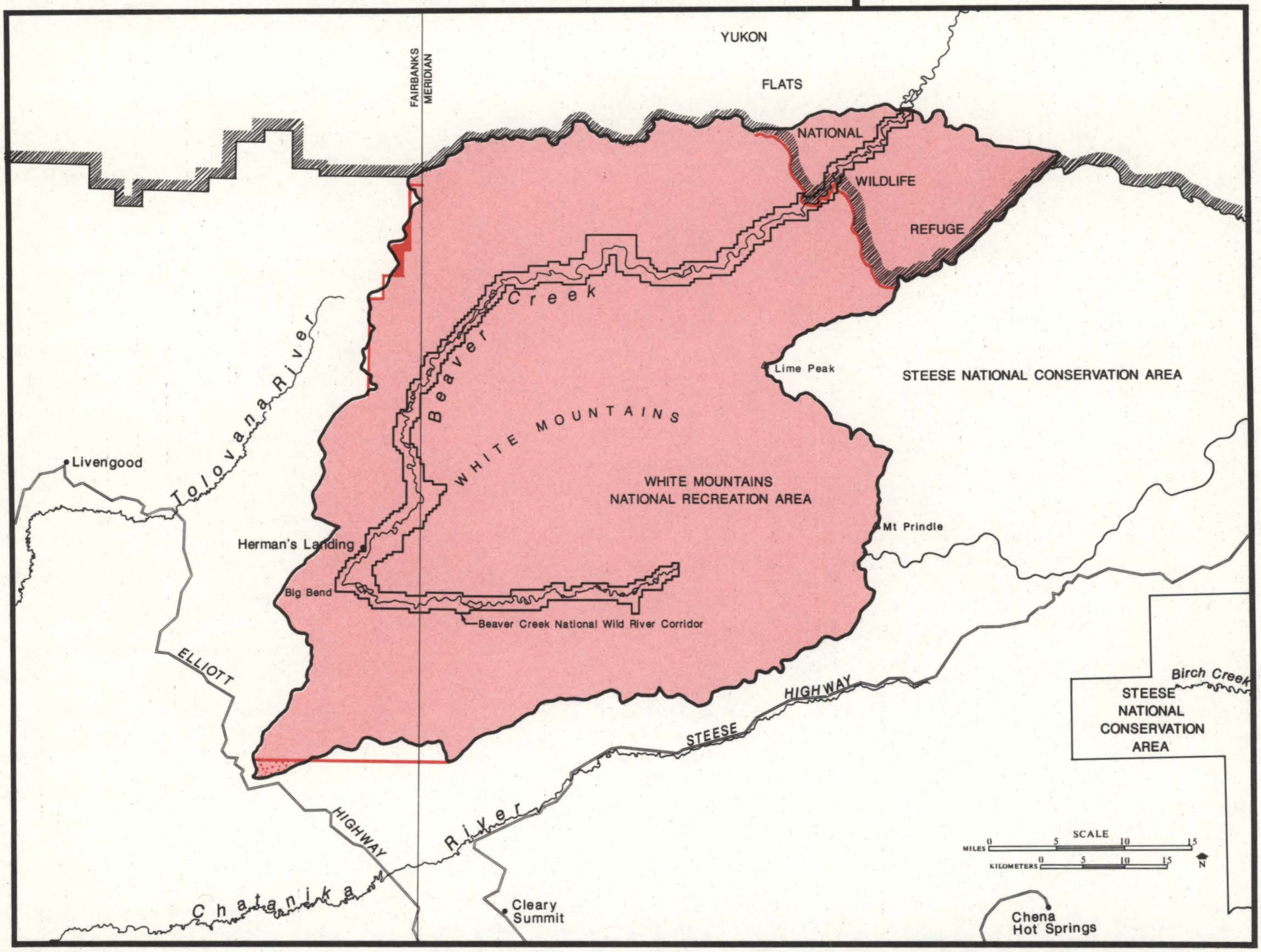
That portion of the Beaver Creek watershed referred to as "study area" in this document

Beaver Creek

FINAL

Cumulative Environmental Impact Statement

Status



Legend

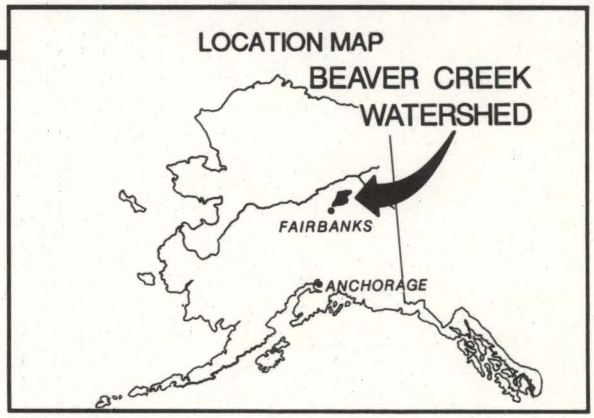
Beaver Creek watershed

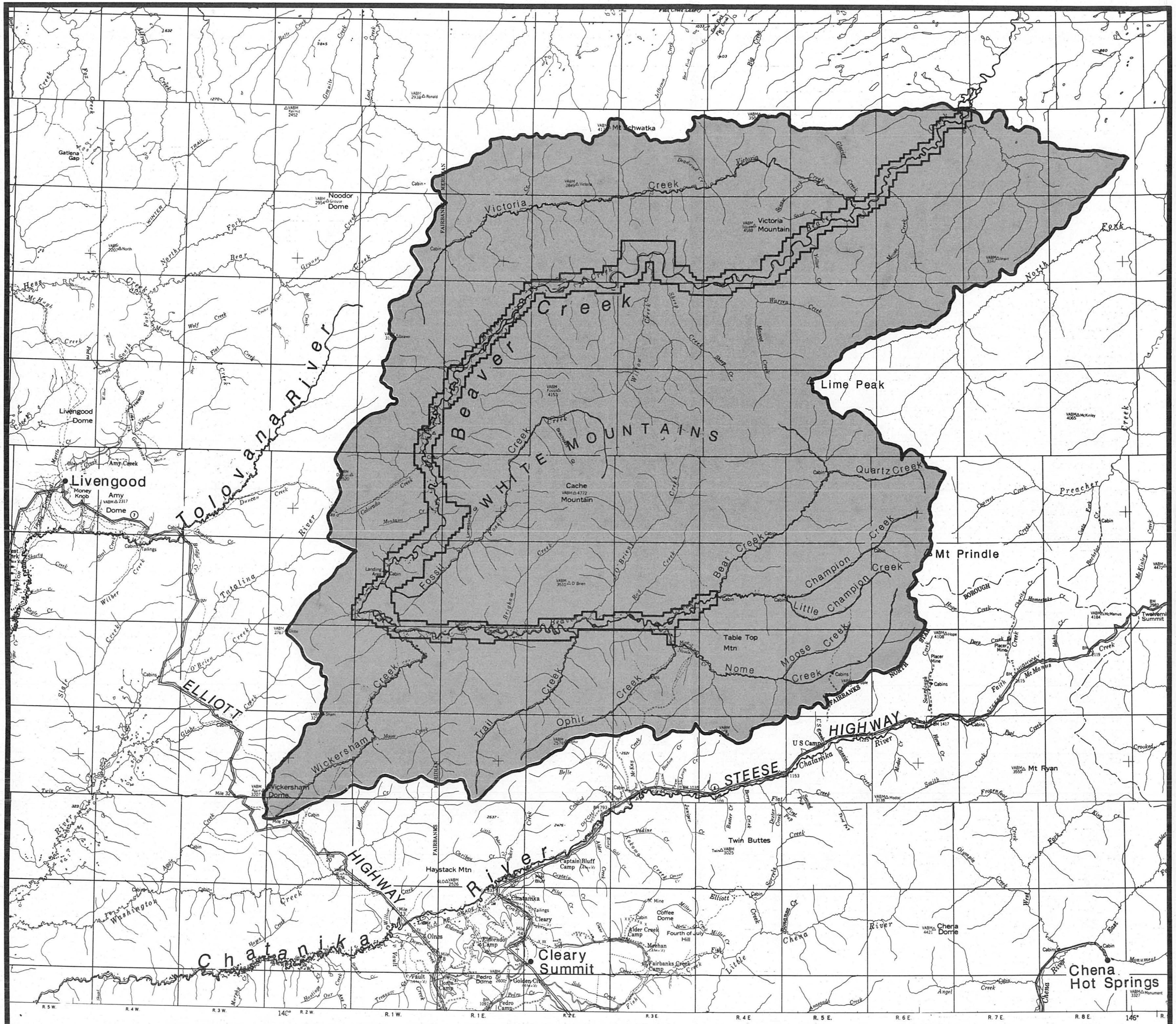
Topfiled State selected lands-within watershed only (This area not open to State selection under PLO 5150)

Tentatively approved State selected lands-within watershed only

Administrative boundary for White Mountain National Recreation Area, shown only when different from Beaver Creek watershed boundary

Yukon Flats National Wildlife Refuge





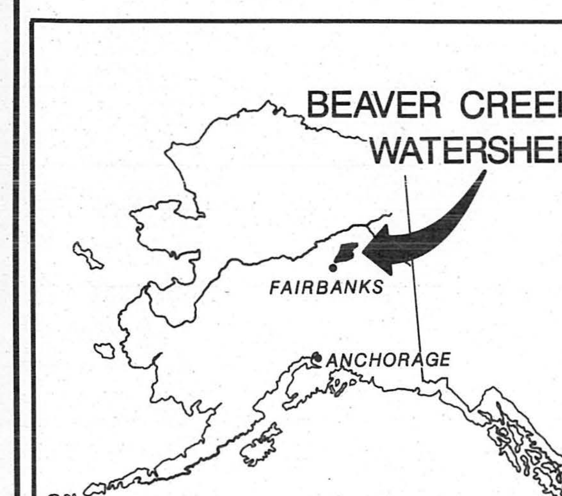
Beaver Creek

FINAL

Cumulative Environmental Impact Statement

Tributaries and Main Physical Features

Beaver Creek Watershed



SCALE

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1.5 Scoping and Major Issues

As required by NEPA regulations, BLM used an open process to gather public input. Initially, this was accomplished by conducting a series of public meetings in locations throughout the affected area in September and October 1987.

The Notice of Intent to prepare the environmental impact statements was published in the Federal Register on August 18, 1987, and in local newspapers in late August 1987.

Scoping Meetings

Scoping meetings were held between September 9, and October 6, 1987, at Livengood, Minto, Central, Chicken, Birch Creek Village, Fairbanks, and Anchorage, Alaska. Prior to the meetings, more than 450 notices of the public meetings were sent out to miners, environmentalists, native groups, and other interested publics.

The BLM also invited participation from other government groups, private organizations, the placer mining industry, and concerned individuals. At the scoping meetings a description of the EIS process and the proposed activity was provided by the appropriate BLM District Managers. The meetings were then opened to members of the public to voice their concerns and to ask questions about the issues. All comments were recorded on tape. Members of the public wishing to submit written comments on scoping and issues were requested to do so before October 20, 1987. All written and oral presentations were considered and incorporated into a list of significant issues.

Significant issues include:

- **What are the impacts of placer mining operations on water quality?**
- **How are water quality standards regulated and enforced and who performs this function?**
- **What are the impacts of placer mining on terrestrial habitats?**
- **What are the impacts of placer mining on subsistence uses?**
- **Have reclamation practices and improved management under the 43 CFR 3809 regulations occurred since 1981?**
- **What are the impacts of other agency laws and regulations on the placer mining industry?**

Specific coordination meetings were held with various State of Alaska agencies such as the Department of Natural Resources (ADNR), Department of Environmental Conservation (ADEC), Department of Fish and Game (ADF&G), and the Office of Management and Budget, Office of the Governor. Meetings were also held with the Federal Environmental Protection Agency (EPA), U.S. Army Corps of Engineers (Corps), the National Park Service (NPS), the U.S. Bureau of Mines (BOM), and the U.S. Fish and Wildlife Service (USFWS).

By December 1, 1987, more than 32 written responses were received. Chapter Five, Consultation and Coordination, identifies the contacts, participation, and coordination more fully.

1.6 Relationship to Law, Regulation, and Policy Implemented by BLM

Management of BLM lands is guided by existing laws, established planning documents, and programmatic and regulatory guidelines.

The legal framework is particularly complex, with more recent legislation aimed at environmental conservation which partially modifies, but does not replace, previous legislation that provides for use and development of the public land resources. The following laws and regulations provide the basic guidance for BLM's day-to-day management of the area affected by this EIS:

- General Mining Law of 1872, 30 USC Sec 22 et seq., as amended.
- Wild and Scenic Rivers Act, P.L. 90-542, October 2, 1968 (82 Stat 906).
- Federal Land Policy and Management Act of 1976 (FLPMA), P.L. 94-579, October 21, 1976, 43 USC Sec 1707, et seq.
- Alaska National Interest Lands Conservation Act (ANILCA), P.L. 96-487, December 2, 1980 (94 Stat 2371).
- Surface Management of Public Lands Under the U.S. Mining Laws, 43 CFR 3809.

The above laws and regulations identify the general standards under which placer mining can take place in the Beaver Creek drainage. The interrelationships of these documents in guiding management of placer mining can be summarized as follows:

Mining Laws

The 1872 Mining Law provides for the exploration, development, production, and purchase of mineral resources of the public lands, as well as the right of access to mining claims, as had been provided by the Act of July 26, 1866 (39 Stat 52, et seq.). These laws were designed to facilitate the disposal of mineral resources and did not provide any environmental safeguards. Subsequent legislation modified the mining law to assure that other values would be protected.

FLPMA

Congress, in FLPMA, [43 USC 1732(b)] provided that "in managing the public lands the Secretary shall, by regulation or otherwise, take any action necessary to prevent unnecessary or undue degradation of the lands." With this notable exception, and several other specific sections governing procedures for recordation of mining claims and other topics, FLPMA provided that "no provision...of this Act shall in any way amend the Mining Law of 1872, or impair the rights of any locators or claims under that Act..."

Mining Regulations in 43 CFR 3809

The regulations in 43 CFR 3809 were formulated to establish procedures to prevent unnecessary or undue degradation of federal lands which could result from operations authorized by the mining laws. In 43 CFR 3809.0-5(k) "undue or unnecessary degradation" is defined as "surface disturbance

greater than what would normally result when an activity is being accomplished by a prudent operator in usual, customary, and proficient operations of a similar character..." Failure to initiate and complete reasonable reclamation may, and failure to comply with applicable environmental statutes will, constitute unnecessary or undue degradation. The BLM has recognized this by making compliance with these laws a specific requirement for any mining operation (43 CFR 3809.2-2).

ANILCA

Two special designations overlie the Beaver Creek watershed, or portions of it: the White Mountains National Recreation Area and the Beaver Creek National Wild River, both established by ANILCA. Almost the entire area affected by this EIS is within the boundaries of the one-million acre White Mountains National Recreation Area (NRA), as shown on the Status Map in this chapter. The Beaver Creek National Wild River (NWR) extends from the headwaters of Beaver Creek at the confluence of Bear and Champion Creeks, downstream for 127 river miles. All but the lower 16 miles of the Beaver Creek NWR are within the White Mountains NRA.

ANILCA provides the basic framework for management of the White Mountains NRA. According to Section 1312(a):

> "The White Mountains National Recreation Area... shall be administered... in order to provide for public outdoor recreation use and enjoyment and for the conservation of the scenic, scientific, historic, fish and wildlife, and other values contributing to public enjoyment of such area. Except as otherwise provided in this act, the secretary shall administer the recreation area in a manner which in his judgment will best provide for (1) public outdoor recreation benefits; (2) conservation of scenic, scientific, historic, fish and wildlife, and other values contributing to the public enjoyment; and (3) such management, utilization, and disposal of natural resources and the continuation of such existing uses and developments as will promote or are compatible with or will not significantly impair public recreation and conservation of the scenic, scientific, historic, fish and wildlife, or other values contributing to public enjoyment."

Section 10(a) of the Wild and Scenic Rivers Act provides similar direction for management of the Beaver Creek National Wild River:

> "Each component of the National Wild and Scenic Rivers System shall be administered in such a manner as to protect and enhance the values which caused it to be included in said system without, insofar as it is consistent therewith, limiting other uses that do not substantially interfere with public use and enjoyment of these values..."

The Wild and Scenic Rivers Act withdrew all components of the National Wild and Scenic Rivers System then or subsequently designated, and ANILCA withdrew the White Mountains NRA, from disposition under the public land laws, including further mineral entry (the location of new mining claims). However, the two acts emphasized that except as specifically provided, nothing contained within them affects the applicability of the U.S. mining laws. Both acts direct the managing agency to recognize valid existing rights when administering the areas for the purposes for which they were primarily established.

ANILCA Section 403 contains the following language which specifically modifies Section 1312, quoted previously:

> "Subject to valid existing rights, the Secretary shall administer the (White Mountains National Recreation) area in accordance with the provisions of Section 1312."

ANILCA also reserves to holders of unperfected claims, the right to continue operations on the claim. Section 404(b) makes the following provision for continuing work on unperfected claims:

> "Any mining operation...shall be subject to such reasonable regulations as the Secretary may prescribe to assure that such operations will, to the maximum extent practicable, be consistent with protection of the scenic, scientific, cultural, and other resources of...the White Mountains National Recreation Area or any affected conservation system units..."

ANILCA Sections 402 and 605 required BLM to complete individual management plans for the White Mountains NRA and Beaver Creek NWR, a requirement which was met by preparing the following documents:

> River Management Plan for the Beaver Creek National Wild River, October 1983.
>
> White Mountains National Recreation Area Resource Management Plan and Environmental Impact Statement, February 1986.

The Beaver Creek National Wild River Management Plan

The Beaver Creek NWR Management Plan did not provide specific direction for the management of placer mining on federal lands since there are no active placer claims within the legal boundaries of the NWR. The river management plan acknowledged that placer mining in the headwater tributaries of Beaver Creek was affecting recreational users of the Wild River, but stated that mining in the White Mountains NRA outside the NWR boundary would be addressed in the resource management plan (RMP).

The White Mountains National Recreation Area RMP

The White Mountains NRA RMP affirmed that placer mining would be managed in accordance with the stipulations of 43 CFR 3809, and the direction provided by ANILCA. In addition, specific policy for the NRA was established to manage those aspects of placer mining for which ANILCA reserved discretionary authority to BLM. The RMP provides that no lands within the NRA will be opened to the leasing of placer deposits, and that cross-country movement of mining equipment should be done in winter, and cannot be undertaken without advance approval by the authorized officer.

The RMP states that the overall management strategy for the White Mountains National Recreation Area is to provide for a variety of public outdoor recreation opportunities emphasizing primitive and semi-primitive values, to protect and/or improve the water quality of Beaver Creek, and to provide for multiple use of other resource values which are compatible with the recreation goals. The ac-

tions proposed by this EIS are compatible with the RMP goals. Where necessary, specific stipulations may be attached to mining Plans of Operations to meet the goals.

Other Laws and Regulations

BLM would continue to review and authorize individual Plans of Operations for placer mining under 43 CFR 3809 and the Alaska 3809 Handbook, as well as other applicable laws and regulations. BLM land use plan amendments may be needed if it appears that any land use classification needs to be changed. Besides the laws cited in this section, other laws, administered principally by agencies other than BLM, regulate placer mining.

1.7 Relationship to those Laws, Regulations, and Policies Implemented Principally by Other Agencies

Approval of a Plan of Operations is contingent on the operator meeting all other applicable State and federal laws and regulations. These include appropriate water quality standards promulgated by EPA and Alaska DEC.

Clean Water Act

Water quality and its associated environmental problems are extensively regulated by statutes which BLM does not administer. The principal federal regulatory device to ensure water quality is the Clean Water Act, 33 USC 1251, et seq. The Corps regulates placement of dredged and/or fill material in waters and wetlands under the Clean Water Act.

Regulation of Water Pollution

Water pollution control is specifically regulated and permitted on the federal level by the EPA and the Corps (33 USC 1331, 1342, 1344), and by the State of Alaska (A.S. 46.030.50). Water quality standards are established and certified by the State (33 USC 1313, 1341).

> "Where the BLM has evidence of suspected noncompliance with the State or federal water quality laws and regulations, the appropriate office of the EPA and/or DEC will be notified. The EPA and/or DEC have the responsibility for enforcement of the federal Water Pollution Control Act and applicable regulations" (DOI 1986a).

EPA regulates effluent. The EPA guidelines specify that open-cut mines that process over 1,500 cubic yards of ore per year must have a resultant volume of process wastewater which does not exceed the volume of infiltration, drainage and mine drainage waters that is in excess of the make-up water required for operation. The concentration of pollutants in discharged process wastewater must not exceed an instantaneous maximum settleable solid limit of 0.2 ml/l. EPA issues National Pollution Discharge Elimination System (NPDES) permits, which must take into account State

water quality requirements. In Alaska, these permits are issued by Region 10 and include limits on arsenic and turbidity based on the Alaska water quality standards.

This EIS evaluates standards of various agencies in the alternatives. While BLM cannot implement other agency standards, it can assess the cumulative impacts of these standards. In the case of EPA, the standards are under discussion and this evaluation is not meant to suggest these are the final agency recommendations.

Other Agency Plans

Additionally, the BLM will coordinate with other agency plans. Plans of agencies with adjacent land holdings include:

- Alaska Interagency Fire Management Plan, Upper Yukon, Fortymile River, BLM - 1984
- The Tanana Basin Area Plan for State Lands, State of Alaska - June 1985
- Yukon Flats National Wildlife Refuge Final Comprehensive Plan - October 1987
- Fairbanks North Star Borough Comprehensive Land Use Plan - 1988

After review of these plans, the BLM finds no inconsistencies between its management direction and the other plan recommendations.

1.8 Additional Considerations

BLM and the Corps must comply with a multitude of other laws, regulations, and federal Executive Orders, in addition to the primary ones cited in Sections 1.6 and 1.7. Figure 1-2 summarizes elements which must be addressed in every environmental impact statement, the source of that requirement, and how the element is addressed in this EIS.

1.9 Cooperating Agency

The U.S. Army Corps of Engineers is a cooperating agency on this EIS. To the extent possible, this EIS incorporates NEPA documentation that can be incorporated into future authorization of work by the Corps.

Numerous activities associated with placer mining require Department of the Army authorization pursuant to Section 404 of the Clean Water Act. Activities requiring authorization include, but are not limited to, the following: placement of dredged and/or fill material into waters of the United States including wetlands, stockpiling overburden and placer-bearing deposits, construction of stream diversions, construction of roads and foundation pads, reclamation, and similar works.

At the present time, the Corps does not have reclamation standards for placer mining, nor is it in the process of developing such standards. Any reclamation required by Department of the Army (DA) permit will be determined on a case-by-case, site-specific basis for each individually authorized

project. In addition, certain requirements for reclamation may be associated with general permits (GP) and/or any special procedures such as the proposed abbreviated processing (APP), if issued.

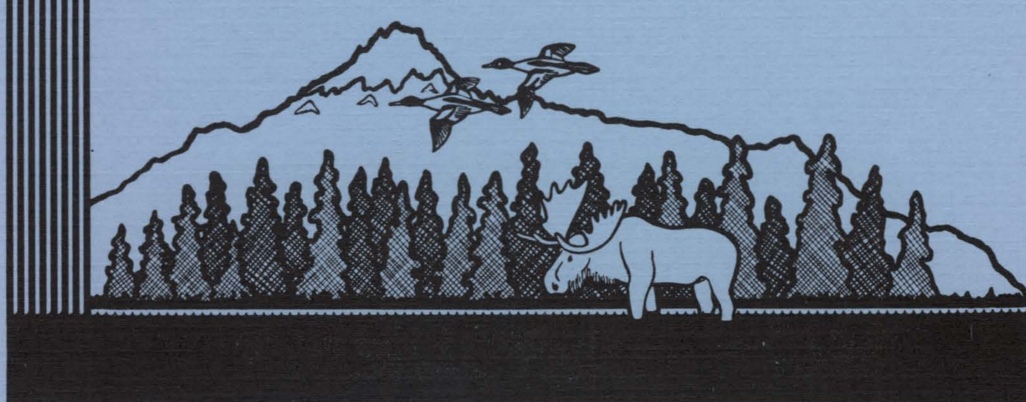
As a cooperating agency, the Corps assisted BLM in scoping processes and in reviewing the development of the draft and final Environmental Impact Statement. The review and comments pertain to Corps areas of jurisdiction and authority, i.e., flood control, navigation, and regulatory functions. Members of the Corps staff have contributed consultation and document review to the preparation of the EIS to ensure that the procedural and statutory requirements of the Corps are satisfied.

The Corps' permit program regulates development of the nation's waters and wetlands through its public interest review process. Within the Beaver Creek watershed, the Corps has jurisdiction over work subject to Section 404 of the Clean Water Act, i.e., the placement of dredged and/or fill material into waters of the United States, including wetlands, stockpiling overburden and placer-bearing deposits, construction of stream diversions, roads and foundation pads, reclamation and similar works. Issuance of a DA permit is required for work proposed on State and private as well as federal mining operations. See Appendix F-1 for a description of the Corps regulatory program.

ELEMENT	SOURCE OF REQUIREMENT	TREATMENT IN THIS EIS
Air Quality	The Clean Air Act as amended (42 USC 7401 et seq.)	Would not be affected. 43 CFR 3809 regulations require operators to comply with applicable federal/State standards
Areas of Critical Environmental Concern	Federal Land Policy and Management Act of 1976 (43 USC 1701 et seq.)	None in the affected area
Cultural, Historical, and Paleontological Resources	National Historic Preservation Act as amended (16 USC 470) Antiquities Act of 1906 (16 USC 431-433)	Sections 3.8 and 4.8
Endangered or Threatened Species	Endangered Species Act of 1973 as amended (16 USC 1531)	Sections 3.5.4, 3.6.1, 4.6.7
Farm Lands (prime or unique)	Surface Mining Control and Reclamation Act of 1977 (30 USC 1201 et seq.)	None within the affected area
Flood Plains	E.O. 11988, as amended, Flood Plain Management, 5/24/77	Public notification and review will be provided for as EA's are prepared for individual operations within a flood plain
Subsistence	ANILCA Section 810	Sections 3.9 and 4.9
Wastes, Hazardous or Solid	Resource Conservation and Recovery Act of 1976 (42 USC 6901 et seq.) Comprehensive Environmental Response, Compensation, and Liability Act of 1980 as amended (42 USC 9615)	Sections 3.4 and 4.4
Water, Drinking/ Ground/Quality	Safe Drinking Water Act as amended (42 USC 300f et seq.) Clean Water Act of 1977 (33 USC 1251 et seq.)	Sections 3.4, 4.4, 4.9.1-4.9.5
Wetlands	E.O. 11990, Protection of Wetlands, 5/24/77	Sections 3.5.2.
Wild and Scenic Rivers	Wild and Scenic Rivers Act as amended (16 USC 1271)	Beaver Creek-Sections 3.10 and 4.10
Wilderness	Federal Land Policy and Management Act of 1976 (43 USC 1701 et seq.) Wilderness Act of 1964 (16 USC 1131 et seq.)	None in the affected area
Energy	40 CFR 1502.16(e)	Not applicable
Coastal Zones	Coastal Zone Management Act of 1972 (16 USC 1451)	None in the affected area
Noise	Noise Control Act of 1970 (42 USC 4902 (b))	Not applicable

Figure 1-2. Elements, legal requirements, and their treatment in this EIS.

Chapter II
Description of Alternatives



BEAVER CREEK

2.1 Introduction

The National Environmental Policy Act (NEPA) and the corresponding Council on Environmental Quality (CEQ) regulations require development of alternatives for a proposed action. This proposed action and the alternatives to it are the base for the comparative analysis of environmental consequences of an action. The purpose of the alternatives is to provide a range of management options for the final decision about the proposed action. See Figure 2-7 at the end of this chapter for a comparison of pre-1981 impacts with those of the 1987 mining season, and projected 1998 impacts under the proposed action and the alternatives.

2.2 Development of the Alternatives

The alternatives have been designed to address the two major objectives of the study: 1) consider performance standards under which placer mining may be conducted on federal lands in the area, and 2) comply with court orders to conduct a cumulative impact environmental analysis for the Beaver Creek watershed and prepare the corresponding documents.

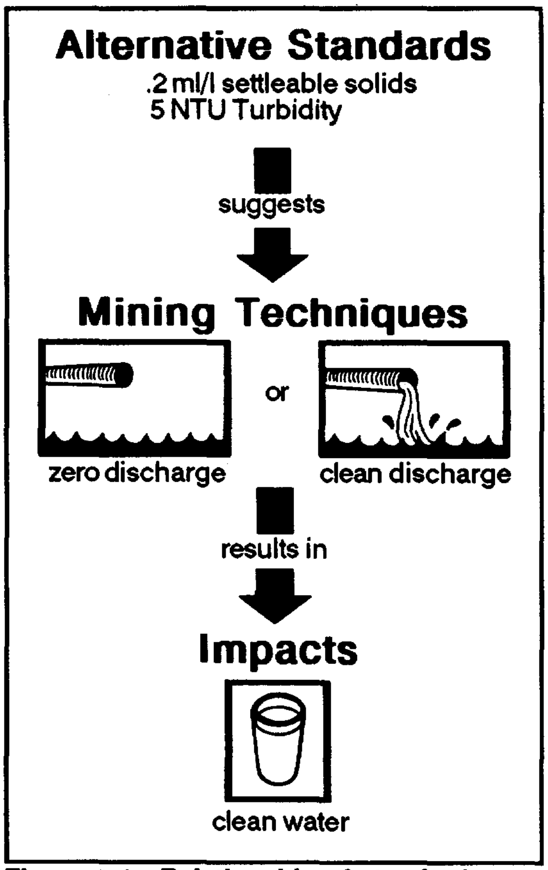


Figure 2-1. Relationship of standards, mining techniques, and impacts.

Additionally, issues and concerns raised by the public and other agencies were carefully considered and incorporated into the final alternatives where appropriate. Public comments are summarized in Chapter One.

An initial set of alternatives was published in the Notice of Intent for the preparation of this and the three other placer mining EISs (DOI 1987a). These alternatives provided a basis for discussion with interested public groups, individuals, and other agencies during the scoping period. After scoping by interested public groups and other agencies, the alternatives were finalized (Section 2.3). These alternatives are the framework for the analysis of the environmental effects and the cumulative impacts of these effects. Action scenarios were developed for the standards outlined in each alternative. These are mining techniques that could be used to meet the performance standards. Environmental impacts were analyzed from these mining techniques (Figure 2-1).

2.3 Description of the Alternatives

Alternatives for this study are based on a range of performance standards. For BLM, the standards are based on the jurisdiction BLM has within the 43 CFR 3809 regulations and the relevant RMP, River Management Plan, other plans, and mandates of the court injunctions. **Other standards used to evaluate cumulative impacts lie within the regulatory and enforcement authority of State and other federal agencies.**

The 43 CFR 3809 regulations are general, and allow some discretion in two main areas: 1) the application of the definition of undue or unnecessary degradation to the environment and specific operations and 2) reclamation of surface disturbance. Performance standards are used to form the spectrum of the EIS alternatives for these two areas. One alternative addresses performance standards under discussion by other agencies. Alternative D is the "no mining" alternative as defined by the Court.

One and one-half tons of gold at the Alaska Commercial Co. store in Dawson, Canada, circa 1901. From the Lulu Fairbanks collection, courtesy of the Alaska and Polar Regions Department Archives, University of Alaska, Fairbanks.

As used in this document, these are the definitions for performance standards, and management goals and mining techniques:

A **performance standard** is a measurable quantity which determines the allowable environmental impacts resulting from mining and related activities in the Beaver Creek watershed (Figure 2-1). These standards set maximum or minimum limits that must be met to legally operate a mine in the watershed. The standards for the watershed are based on the overall goals established by the White Mountains National Recreation Area RMP, the River Management Plan, and the specific resources present.

A **management goal** is a broad overarching purpose for an area. Goals have been developed through the planning processes of BLM and other agencies for the watersheds being considered in this and other studies. For example, the White Mountains National Recreation Area RMP establishes two goals for management of Beaver Creek as a National Wild River: 1) provide for public outdoor recreational opportunities that emphasize the existing natural primitive and semi-primitive values; and 2) protect and maintain the water quality of Beaver Creek National Wild River (DOI 1986b).

Mining techniques are the methods miners employ to operate their mines. Mining techniques include activities associated with exploration, access, development, mineral extraction, and reclamation. Techniques used for mining and mitigation measures that are used to meet the performance standards are often site specific and are defined in the appropriate Environmental Assessment (EA) for a Plan of Operations.

Action Scenario for Mining and Reclamation Activities

There are several mining methods available that could be used to achieve the identified performance standards. One such scenario is presented here as an example. Other methods are presented in varying detail in numerous publications, such as "Best Management Practices for Placer Mining" (ADF&G 1986a) and "Placer Mining Demonstration Grant Project Final Report" (ADEC 1987a). These other mining methods and their associated surface disturbances are similar to the mining method and surface disturbance descriptions that follow.

After mining equipment has been transported to the site, a camp is set up for the duration of the season. The mining season generally lasts from June until the ground freezes in late September or October. The camp usually accommodates two to five miners with support facilities for maintenance and storage. After the camp is established, the associated physical mining infrastructure is constructed with a bulldozer or other earth moving equipment. This infrastructure usually consists of two or more settling ponds, associated diversion dikes and spillways, drainage ditches to prevent erosion and collect run-off and ground water, and working areas for the washplant, pumps, and motors.

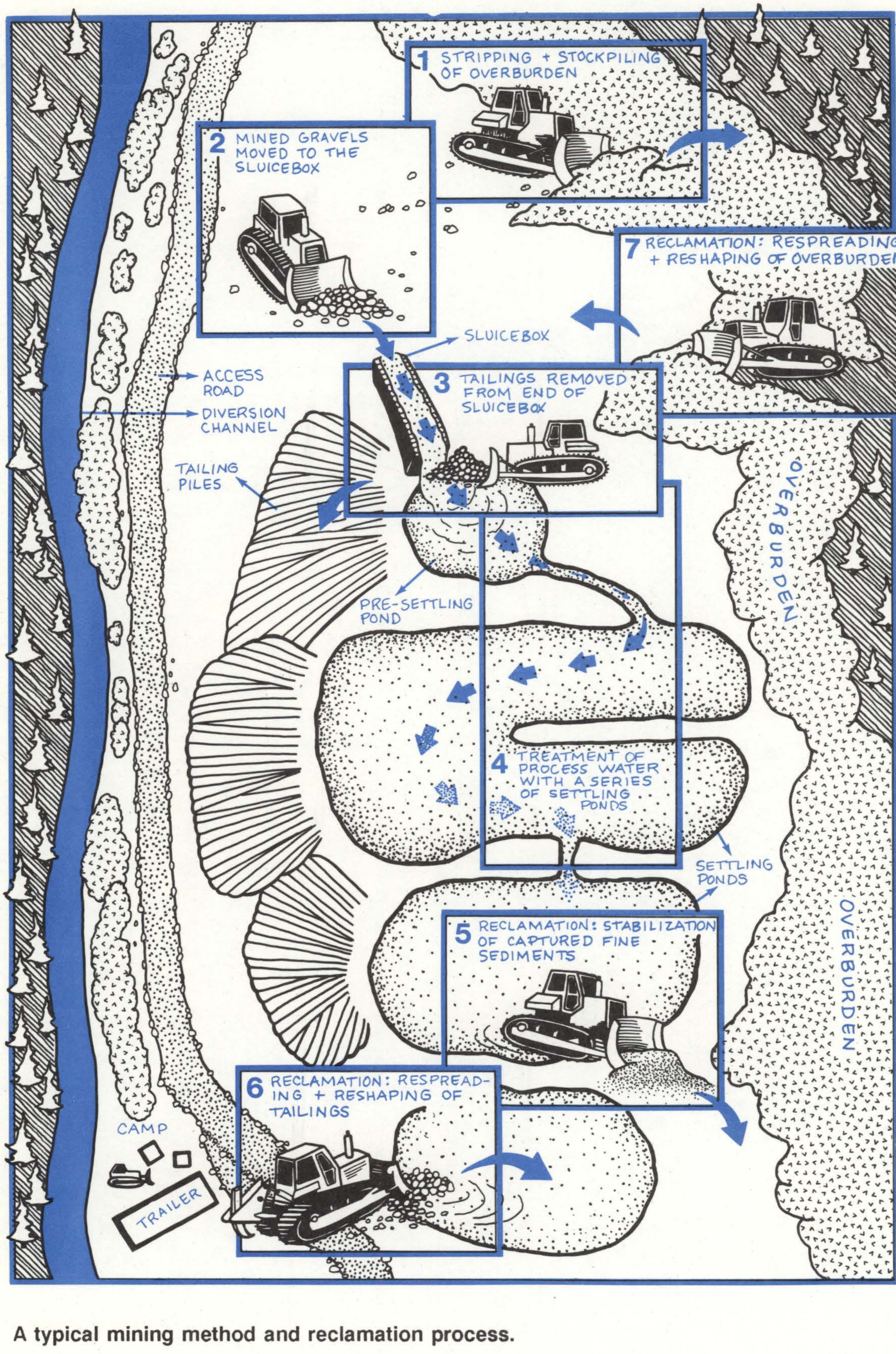
Actual mining activities usually begin after the infrastructure has been constructed. Trees and brush are cleared, and topsoil and overburden are stripped from the area to be mined. The stripped topsoil and overburden are stockpiled (separately if possible), usually near the mine cut, and are

protected from erosion and flooding. With adequate planning, these stockpiles may be placed in a manner that promotes efficient site reclamation through reduced material handling and shorter hauling distances. Topsoil may have been stripped during the preceding mining season to allow permafrost in layers of overburden or gold-bearing gravel to thaw. If not, frozen overburden and topsoil may be ripped and stockpiled by bulldozer. The extent of the area to be stripped depends upon the expected rate of production. On a typical mine, one acre is usually stripped before actual mining begins. Total disturbance for an entire mine at any one time averages between three and eight acres.

Exposed gold-bearing gravels are mined using a bulldozer that pushes and stockpiles the gravel near a washplant. The stockpiled gold-bearing gravel is then fed into the washplant by a front-end loader or large backhoe. This practice promotes equipment efficiency by allowing the bulldozer to continue mining while the loader or backhoe feeds the washplant at a steady rate. When the mined gravel is fed into the washplant, it is classified by particle size using various stationary or vibrating screens. Classifying gravels provides for more efficient gold recovery, reduced water consumption, and facilitation of mine site rehabilitation, and is practiced by most operators. The oversize material, usually larger than two inches, slides out of the washplant into a pile where it can be moved by a front-end loader or bulldozer. The undersize material and gold-bearing gravel is mixed with water and flows through the sluicebox where the gold and heavy black sands are concentrated. Tailings are gravel, sand, and other materials accumulated at the end of the sluicebox. Tailings are routinely moved away from the sluicebox by a loader or bulldozer.

Sluice box. Bureau of Land Management Photo.

The water that carries the gold-bearing gravel through the sluicebox becomes sediment-laden and turbid. This "muddy" process water flows from the end of the sluicebox over a pile of fresh tailings into a series of settling ponds. These ponds are designed to hold the "muddy" water long enough for the fine sediments to settle. The physical design of the ponds depends upon the amount of water flowing through the system, the sediment characteristics of the gravels being worked, and the physical characteristics of the site. Most mines use a series of small settling ponds to permit more flexible water management. Small ponds are usually easier to build, repair, clean, replace, bypass, and rehabilitate than larger ponds. The use of pre-settling ponds is encouraged. A pre-settling pond is located in the tail race between the sluice and the first settling pond. Sands and other heavy settleable solids are collected here where they are easy to wash.



A typical mining method and reclamation process.

Settling Ponds. Bureau of Land Management Photo.

Settling ponds also hold sediment-laden surface runoff water from excavated or stripped areas that would otherwise pollute "clean" surface and runoff water. Another water management practice is to divert clean runoff or ground water around the operation and into an adjacent stream or bypass. This minimizes the amount of clean water that flows into the settling ponds. These water management practices are commonly practiced by most operators. If these practices are not used by the operator's own initiative, they may be suggested as mitigating measures to improve mine effluent treatment efficiency. These are mitigating measures which ADEC, EPA, and ADF&G apply in order to attain State water quality standards and federal effluent guidelines.

Water used in the sluicing process is pumped from the nearby stream through the washplant and into the settling ponds. Water intake from the stream is suspended when the ponds contain enough water to support continued sluicing operations by recycling pond water to the washplant. In some cases, groundwater seepage into the settling ponds may be sufficient to eliminate the need for adding stream water to the system.

A mitigating measure placed on the Nome Creek mining operation in 1987 was that zero discharge of mine effluent into Nome Creek, a tributary of Beaver Creek, was required to protect its water quality and resident fish. Zero discharge means water is not released back into a stream either through a pipe, an overflow, or by visible seepage through a dam or tailings filter. Underground flow is considered a discharge if the water quality in the stream is measurably impacted. However, some operators with so-called zero discharge systems do have occasional discharges, usually due to seepage through settling pond dikes. This seepage almost always meets the settleable solids effluent standards, and in most cases the seepage discharge is of better quality with less settleable solids and lower turbidity than the water discharged directly from a settling pond. The practice of zero discharge and the recycling of mine water contributes to compliance with State water quality standards and federal effluent limitations.

For the typical placer mine on federal claims, reclamation begins upon completion of the final mine cut or at the end of the mining season. If mining has been completed at the location, tailings are moved into the mine cut and the site is leveled or reshaped. The leveled tailings are then covered with available overburden and topsoil. These actions are usually completed with a bulldozer. Settling ponds may be reclaimed by stopping water inflow and allowing the ponds to drain. Tailings are then

pushed over the ponds to contain the captured settleable solids and armor the basins from future erosion. Overburden and topsoil, if available, are spread over the armored ponds as well. The reclaimed site is allowed to revegetate naturally.

In specific situations, additional steps may be appropriate. If available quantities of topsoil are insufficient to promote adequate revegetation of the site, then the Authorized Officer (AO) may require that settleable solids captured in settling ponds be utilized for reclamation efforts. Diverted stream reaches would be restored to conditions that approximate premining length, flow velocity, hydraulic gradient, and cross sectional configuration, unless the operator can demonstrate to the AO that a stream's present location and configuration are more appropriate. Fish habitat will be provided for in mined or rechanneled streams where fish habitat existed prior to mining. Actions to improve site reclamation may be required by the AO to control non-point source erosion to the stream. Such actions could include the seeding and/or fertilizing of the reclaimed mine site to accelerate the natural succession of vegetation.

If mining has not been completed at the location, the mine site is stabilized in preparation for the next mining season. Settling ponds that will be used in future operations are isolated from additional water inflow, while ponds of no further use are reclaimed as discussed above. Berms around ponds, stream bypasses, and the active mine site are reinforced and equipment is moved to high ground.

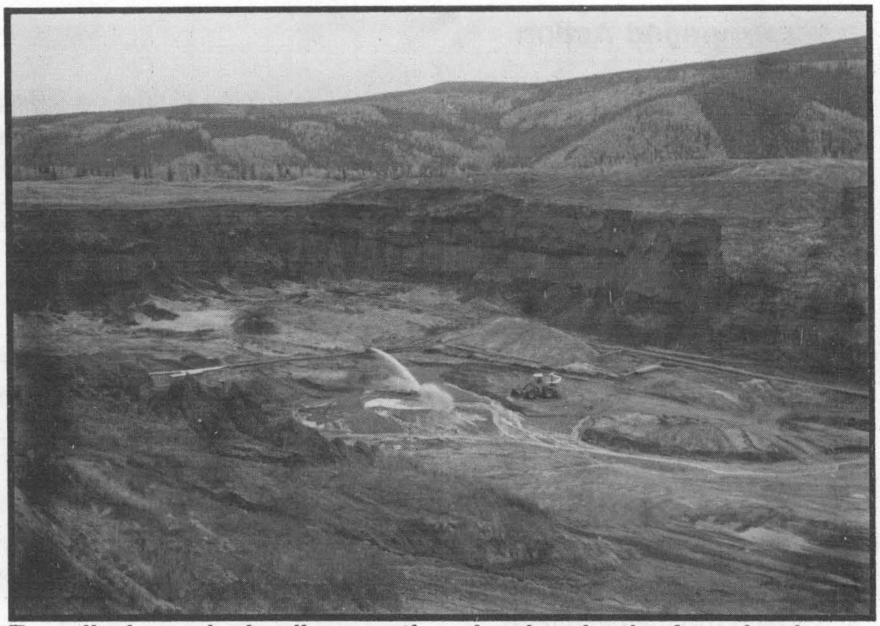
2.3.1 Actions Common to all Alternatives

Existing Laws and Regulations

Some management actions which are applied to mining under all alternatives are those established by existing laws, regulations, or RMP decisions (Sections 1.6-1.8). BLM provides overall management of placer mining on public lands under the 43 CFR 3809 surface management regulations. The Corps regulates the placement of dredged and/or fill materials into waters of the United States, including wetlands, under regulations found at 33 CFR 320 et seq. Other agencies manage water quality, fish and game populations, and other resources under their corresponding laws and regulations.

Inspections and Bonding

BLM compliance officers conduct inspections of placer mining operations on federal claims. Currently, all operations are inspected at least once each year, and most are inspected at least once during the mining phase of the operation and once at the end of the season after site reclamation has been completed. The primary concern of the compliance inspector is that the miner is operating appropriately and that reclamation work is acceptable. During each compliance visit, an inspection record is completed that describes the inspector's observations of the operation. If any problems or violations exist at the mine site, the compliance inspector discusses them with the operator, sets a time frame for correction of the situation, and issues a notice of noncompliance, if necessary. The mine site is revisited to ensure that corrective actions have taken place.



Zero discharge hydraulic operation showing depth of overburden.

Bonding of placer mine operators on federal claims is a management tool which is authorized by the surface management regulations in 43 CFR 3809.1-9. Bonding can ensure that a mine site is reclaimed to the satisfaction of the authorized officer. By Bureau policy, bonding of mining operations at the plan level is a discretionary action; however, bonding is required when an operator has established a record of noncompliance. "A record of noncompliance is established when an operator: a) fails to take necessary actions on a notice of noncompliance issued under an approved plan, a previous plan, or a notice, until enjoined in a proper court, or b) conducts operations other than casual use without submitting a Notice or acquiring an approved Plan and fails to file a Notice or a Plan until served a notice of noncompliance" (DOI Manual, DOI 1985a). The bond amount is usually equal to the estimated cost for the BLM to complete adequate reclamation at the mine site.

Access

From Fairbanks, the area is reached via the Steese Highway and northbound U.S. Creek Road to Nome Creek. These gravel roads are maintained by the State and are capable of handling the transportation of heavy equipment used by placer miners. Mines along Nome Creek are reached by traveling over old, leveled dredge tailings. Sites not located along Nome Creek are reached by miners and their equipment over existing unimproved two-tracked trails used by four-wheel drive trucks and wheeled or tracked off-road vehicles. These roads, trails, and the major tributaries of the Beaver Creek drainage are shown on the Placer Mining Operations and Access Roads Map in Chapter Three. Mining equipment is transported to the more remote areas during the winter or early spring over winter trails. Access to remote sites in the summer is routed along approved trails and monitored by the BLM. No new trails were built in 1988; however, BLM is planning to build a recreational road along Nome Creek that would also result in better access to some mining claims.

2.3.2 Proposed Action

The proposed action for this EIS is to manage mining claims on federal lands under 43 CFR 3809 and appropriate regulations of State and other federal agencies. Analysis of the cumulative effects of this Proposed Action includes the past, present, and projected future impacts from federal mines and other non-mining activities in the region.

Standards

The water quality performance standards of significance would be the current EPA effluent guidelines and ADEC water quality standards or the existing EPA variance for turbidity. The performance standards would be .2 ml/l of settleable solids, .05 mg/l arsenic, and 5 Nephelometric Turbidity Units (NTU) above natural conditions when the natural turbidity is 50 NTU or less, and not more than 10% increase in turbidity when the natural condition is more than 50 NTU, not to exceed a maximum increase of 25 NTU at the mine effluent discharge point (18 Alaska Administrative Code 70.020, ADEC 1987b). This detailed turbidity standard will be referred to throughout the EIS as the **5 NTU turbidity standard**.

An EPA variance, as considered in the water quality performance standards of the Proposed Action, would allow a mine operator with a valid National Pollution Discharge Elimination System (NPDES) permit to discharge effluent with a measured turbidity greater than the State standard of 5 NTU above natural background. NPDES permit conditions are assessed at the point of discharge, prior to entering the receiving stream. To obtain this variance, the miner would submit site-specific information to EPA for evaluation of the dilution capability of the receiving stream. This information would include low, medium, and high stream volumes and velocities, size of the stream drainage, annual rainfall, stream water quality, and expected effluent discharge volume. The variance in the turbidity limit of the effluent is then based on careful analysis of these factors.

Reclamation under the Proposed Action calls for tailings, ponds, and soils to be stabilized, stream channel to be restored, and natural revegetation enhanced as required to facilitate restoration.

Action Scenario Under This Proposed Action

The mining operation under the Proposed Action would be similar to the actual mining activity that occurred during the 1987 mining season on the Nome Creek mine. The water quality standards could be met through the utilization of a simple settling process with an approved EPA variance for increased turbidity in mine effluent discharge. Other, more sophisticated, water treatment systems, such as a zero discharge system could also be utilized to meet these standards.

Reclamation activities under the Proposed Action would include several concerns. Topsoil and/or overburden stockpiled during operations would be protected from erosion. The mine site would be reshaped to approximate surrounding physiography utilizing mine tailings, overburden, and topsoil. If available quantities of topsoil were insufficient to promote adequate revegetation of the site, then the AO might require that settleable solids captured in settling ponds be utilized for reclamation efforts. Fine sediments captured in the settling ponds would be stabilized at the end of each mining

season to prevent unnecessary or undue degradation of the environment. At cessation of mining, the diverted stream would be restored to conditions that approximate premining length, flow velocity, hydraulic gradient, and cross-sectional configuration, unless the operator could demonstrate to the AO that a stream's present location and configuration were more appropriate. Fish habitat would be provided for in mined or rechanneled streams where fish habitat existed prior to mining. Actions to improve site reclamation might be required by the AO to control non-point source erosion to the stream. Such actions could include the seeding and/or fertilizing of the reclaimed mine site to accelerate the natural succession of vegetation.

In evaluating the cumulative impacts BLM considered the past, present, and reasonably foreseeable future actions. In this EIS, the past of acres disturbed in the past has been calculated by BLM. Reports like that of Hagler, Bailly and Co. (1987) have summarized historical data of the Beaver Creek drainage. The 1987 mining disturbance was calculated using BLM knowledge and field work, and resources such as the Annual Placer Mining Applications. The future is projected using the methodologies given in Appendix B- 1. For the purpose of the present analysis, it must be realized that the actual interrelationships are complex and largely unknown. Cumulative impacts were evaluated with a simple additive model.

The following figures are used to evaluate the present number of mines and to project the future number of mines and concomitant roads, disturbances, reclamation, and environmental impacts, and place placer mining in perspective as a use of public lands.

Figure 2-2 compares the number of mines in 1987 to the expected number in 1998 under each alternative.

Figure 2-3 is a reclamation and disturbance summary of the projected mining situation for each alternative, with present mining (1987), used as the baseline. Figure 2-4 is a summary of the present (1987) miles of roads and trails and the number of miles of roads and trails projected for each alternative. (Appendix B-1 for methodology).

2.3.3 Alternative A

This alternative would emphasize mining activity as regulated by 43 CFR 3809 and the minimum actions needed to implement the regulations. These regulations identify guidelines for preventing "undue or unnecessary degradation to the environment" and conducting reclamation. Figure 2-5 shows a comparison of the performance standards among alternatives.

Standards

The water quality performance standards would be the standard of .2 ml/l settleable solids, .05 mg/l arsenic, and the 5 NTU turbidity standard when measured at the mine discharge point. No water quality variances would be incorporated in this alternative. Soils and stream channels would be stabilized, and natural restoration and revegetation would be allowed to proceed. All mining operations on federal claims would meet these standards.

	1987	Projected 1998 Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D
Federal Mines	1	5	4	4	3	0
State Mines	0	0	0	0	0	0
Total	1	5	4	4	3	0

Figure 2-2. Comparison of 1987 State and federal mines against projected 1998 State and federal mines under the Proposed Action and the alternatives.

	1987	Projected 1998 Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D
Federal Disturbance	3	115	100	100	84	0
State Disturbance	0	0	0	0	0	0
Total	3	115	100	100	84	0
Federal Reclamation	3	80	70	70	58	0
State Reclamation	0	0	0	0	0	0
Total	3	80	70	70	58	0

Figure 2-3. Comparison of 1987 State and federal mine disturbance and reclamation by acres against projected 1998 figures under the Proposed Action and the alternatives. Pre-1981 disturbance is 352 acres.

1987			1998 PROJECTION Proposed Action		Alternative A		Alternative B		Alternative C		Alternative D	
Jurisdiction	Roads	Trails	Roads	Trails	Roads	Trails	Roads	Trails	Roads	Trails	Roads	Trails
Federal	5.2	23.3	31.4	21.0	27.1	18.3	27.1	18.3	22.4	15.3	5.2	23.3
State/Priv.	2.0	0	2.0	0	2.0	0	2.0	0	2.0	0	2.0	0
Joint	0	0	0	0	0	0	0	0	0	0	0	0
Total	7.2	23.3	33.4	21.0	29.1	18.3	29.1	18.3	24.4	15.3	7.2	23.3

Figure 2-4. Comparison of existing 1987 road/trail jurisdictions and projected 1998 jurisdictions by miles.

Action Scenario Under This Alternative

Many of the streams in the Beaver Creek drainage are clear- flowing during part or all of the mining season. It is unlikely that a mine could discharge any mine effluent into the stream and meet the turbidity standard without the expenditure of considerable effort and money for a complicated water treatment system. For the average-sized mine, it would be simpler and more cost-effective to operate by recycling 100% of mine process water and allowing no discharge into the stream.

Performance standards for reclamation of fish and wildlife habitats, and soil and vegetation stabilization would be less restrictive to mining activities than those standards required by the Proposed Action. Under Alternative A, disturbed topsoil and overburden would be stabilized to prevent erosion into the watershed, but the redistribution of these materials over the tailings would not be required. Tailing piles and open mine cuts would be stabilized and reshaped to allow for natural restoration. This would probably be accomplished by leveling the mine cut and tailing piles with a bulldozer. Any constructed stream bypass would be stabilized or reinforced to make it the permanent stream channel.

2.3.4 Alternative B

This alternative would combine the standards from the 43 CFR 3809 regulations with emphasis on standards established to meet management goals defined in the Records of Decision of the various plans for the watershed. For a clear portrayal of the differences between the alternatives, see Figure 2-5.

Standards

Water quality performance standards would be defined by current EPA permit requirements as .2 ml/l settleable solids, .05 mg/l arsenic and the 5 NTU turbidity standard when measured at below the mine discharge point. Stabilization of soils and creek channels would be conducted so that natural recovery and revegetation processes would be enhanced.

Action Scenario Under This Alternative

Performance standards for water quality would be the same as those under Alternative A. Reclamation standards require that disturbed topsoil and overburden would be stabilized to prevent erosion and soil loss during operations. After completion of mining on a site, the stockpiled material would be redistributed over the shaped mine site to facilitate natural revegetation. Any stream bypass would be stabilized to allow for natural recovery of the stream channel.

Mining methods similar to those used in the Beaver Creek drainage in 1987 could be used to achieve the standards outlined in this alternative. A design that results in zero discharge may be necessary to meet the water quality standards. Reclamation of the creek channels and disturbed areas, with redistribution of topsoil over reshaped tailings, would meet the standards of enhancing the natural recovery processes.

OPERATIONS	Proposed Action	Alt. A	Alt. B	Alt. C	Alt. D
Water Discharge, including runoff	.2ml/l. 5 NTU turbidity. EPA variances .05 mg/l arsenic	.2ml/.. 5 NTU turbidity, no variances .05 mg/l arsenic	.2ml/.. 5 NTU turbidity, no variances .05 mg/l arsenic	0 ml/l. 0 NTU turbidity, no variances .05 mg/l arsenic	N / A
In-stream channel ops.	No limits	No limits	No limits	Careful/limited	N / A
Vegetation Stripping of area	No limits	No limits	No limits	No limits	N / A
Soils Topsoil	Save, stabilize against erosion	Stabilize against erosion	Save, stabilize against erosion	Save, stabilize against erosion	N / A
Shape of site	Stabilize to reduce erosion	Stabilize to reduce erosion	Stabilize to reduce erosion	Stabilize to reduce erosion	N / A
Access	Per RMP	Per RMP	Per RMP	Per RMP	N / A

RECLAMATION	Proposed Action	Alt. A	Alt. B	Alt. C	Alt. D
Water Creek configuration	Reestablish grade & configuration in floodplain	Remain in bypass	Remain in bypass	Reestablish grade & configuration in floodplain	Remain in bypass
Fish habitat	Provide for fish passage; comply with ADF&G regs. rebuild as appropriate	Provide for fish passage; comply with ADF&G regs.	Provide for fish passage; comply with ADF&G regs.	Rebuild w/rocks, pools, riffles, etc.	No requirements
Soils Shape of site	Reshape to approx-imate surrounding physiography	Stabilize to reduce erosion	Reshape to approximate surrounding physiography	Reshape to approximate surrounding physiography	Reshape to approximate surrounding physiography
Fines-ponds	Protect from erosion, and respread as required	Protect from erosion	Protect from erosion	Respread over tailings	Protect from erosion
Topsoil	Respread over tailings	No requirements	Respread over tailings	Respread over tailings	No requirements
Vegetation Revegetation	Natural succession; fertilize & reseed w/ native species as appropriate	Natural succession	Natural succession	Fertilize & reseed w/native species	Natural succession

Figure 2-5. Comparison of the alternatives.

2.3.5 Alternative C

This alternative focuses on various standards, some of which are proposed or under discussion by EPA and other agencies (EPA 1987a). All mining operations in the watershed would meet the proposed standards. Figure 2-5 shows a clear comparison of performance standards used for this and other alternatives.

Standards

The discharge water quality performance standard for this alternative would be zero ml/l settleable solids, .05 mg/l arsenic and turbidity of zero NTU above natural conditions. Reclamation standards would emphasize restoration of a stable, natural appearing landscape, rehabilitation of creek channels, and regrowth of native vegetation. Mining activities would be conducted to minimize impacts to wetlands and riparian zones.

Action Scenario Under This Alternative

Alternative C water quality performance standards would be more stringent than those proposed in the Proposed Action, Alternatives A and B. Under this alternative, the miner would have two realistic options in choosing an appropriate water treatment method for the operation. These options would be: 1) to employ a chemical treatment system to reduce mine effluent settleable solids to zero and turbidity to acceptable levels, or 2) to not discharge any effluent in the stream.

Given these choices, most operators in this drainage would probably choose a zero discharge operation because it is presently more reliable and more cost effective than a chemical system. Chemical treatment systems employ technology which has thus far had only limited success for mining operations in Interior Alaska.

Mining techniques that could be used to meet these performance standards would require very careful planning and infrastructure design before operating. Further work may be required to meet the reclamation standards of Alternative C. This may include actions such as fertilizing and seeding or planting with native species, and rebuilding the creek channel in the original floodplain. The creek would be designed to have pools, riffles, and other natural features. Fine materials from settling ponds may be removed and redistributed over the tailings. Appropriate design and construction of access roads and camps could reduce impacts on wetlands (Corps wetland definition, Section 3.5) and riparian zones. Actions of these types would be required on all mining operations, regardless of land status or size.

2.3.6 Alternative D

Alternative D (no federal mining allowed) is the "no action" alternative defined by the District Court. See Figure 2-5 for a comparison of performance standards between alternatives.

Standards

Under this alternative, no applications for Plans of Operations or Notices would be processed or approved by BLM. This action would violate current regulations (43 CFR 2091.1 for accepting application, and 43 CFR 3809.1-6 for processing applications). This action would also violate the 1872 Mining Law which gives a mining claimant the right to operate subject to surface management regulations. Changes would be required in these regulations and laws for legal implementation of this alternative.

Validity examinations would be conducted for each properly filed mining claim. Appraisals would be done and the owners of valid claims would be compensated accordingly. Stabilization of surface disturbance that has occurred since January 1, 1981 would be required on all federal claims. Further restoration would be allowed to proceed by natural processes.

Action Scenario Under This Alternative

This alternative would require that mining cease on all federal claims within the watershed. BLM would conduct validity exams for all properly recorded claims. Appraisals would be done and the owners would be compensated for their interest in the claims. This would require Congressional appropriation of funds and authorizing legislation. Reclamation standards would be similar to those imposed under Alternative A. Areas disturbed after 1980 would be stabilized with minimal work, and reclamation would be allowed to proceed by natural processes.

2.4 Alternatives Considered, But Eliminated From Further Analysis

During the scoping process, many alternatives were suggested that were considered for analysis but not selected for further study:

1) No Action under NEPA.

BLM would take no action, in either accepting or approving Plan of Operations. This alternative would not be legal under current regulations (43 CFR 2091.1 for accepting applications and 43 CFR 3809.1-6 for processing applications). These regulations require BLM to make a decision on Plans, in most cases within 90 days of receipt.

2) Setting thresholds of maximum water pollution and unreclaimed surface disturbance for a basin, or different levels for sub-basins of a drainage.

The number of mines in a drainage would be limited,based on these thresholds. This concept is similar to that being considered by the National Park Service (NPS) under its Alternatives B and C as discussed at its scoping meetings (NPS 1988). This alternative is not considered viable for the following reasons:

1) The authority of BLM under FLPMA is less extensive than that of the NPS under the Mining in the Parks Act of 1976 (43 USC 1901). BLM is mandated to either approve a Plan of Operations as submitted, or work with the operator to develop measures to prevent unnecessary or undue degradation of federal land (43 CFR 3809.1-5(5)). If the Plan is considered to include activities with excessive impact, BLM will return the Plan and work with the operator to revise the operation. After the revised Plan is deemed sufficient to avoid unnecessary or undue degradation to the environment greater than what would normally result when an activity is being accomplished by a prudent operator, then it is approved by BLM (43 CFR 3809.1-6 et seq.). This procedure

differs from NPS regulations that permits denial of a mining application if the action is deemed to adversely affect or significantly injure federal lands (36 CFR 9.10). This alternative would not be legal for BLM under current regulations.

2) It would be extremely difficult to determine the number of operations that would be working on a creek or in a basin early enough to allocate proportions of sediment load or acreage disturbed at the time of Plan approval. Plans are received throughout the winter, spring, and into the summer months. With a required 30-day turnaround, (this can be extended up to an additional 60 days if conditions warrant, for a total of 90 days), many Plans would be processed before others would be received. In addition, one stream often has operators working State claims, federal claims, and private mines in the same drainage. Again, it would be difficult to determine the number of operations that would be working on a drainage in any given season. Not withstanding the difficulties associated with setting thresholds on a particular stream, the current regulations would have to be amended if earlier submissions or a longer turnaround period were to be provided.

3) The determination of an "allowable threshold" of pollution or disturbance is largely unknown for these basins at this time. An effective model for evaluating the threshold of a stream system would require historic data. Collection of this information would require a major research effort, beginning with several years of data collection, and several more of modeling and analysis. BLM chooses rather to focus effort and finances on the development of effective reclamation techniques and monitoring, in conjunction with cooperation with agencies responsible for development and enforcement of water quality standards and effluent limitation guidelines.

3) Various levels of BLM enforcement, including compliance visits and administration of Plans of Operation applications.

Various levels of enforcement have been included in evaluating the alternatives. Appendix B-3 addresses the levels of enforcement for each alternative.

4) Requiring specific mining and reclamation methods. This range of alternatives was not selected for three reasons: 1) The variation in the natural and mineral-bearing characteristics of the mining areas requires site-specific methods. Limiting all operations to a predetermined set of mining methods would reduce flexibility, and could increase environmental impacts. 2) Mining and reclamation technology is in a state of development and transition. Specific methods would rapidly become out of date and limiting. Emerging technologies are generally better both for mineral recovery and for environmental reclamation, and requiring static technology would restrict both activities. 3) These types of factors receive site-specific consideration in the preparation of EA's required for each Plan of Operations.

5) Changes in regulations and standards by other agencies.

This idea was partially used in Alternative C. The changes in standards are limited to those that were actually being proposed by EPA or being discussed by other agencies at the time BLM developed the alternatives in July-November, 1987. Other changes were not incorporated be-

cause other agencies are mandated with those tasks, and these standards are outside immediate BLM jurisdiction. If new standards are developed by other agencies these may become controlling. For example, if new water quality standards are developed by ADEC or EPA, these new standards must be met by any mining operation.

6) Various alternatives which result in less restrictive standards, especially for water quality.

Water quality alternatives are developed from existing and proposed agency standards. This EIS will calculate the cumulative effects of these standards, and BLM's posture is to require the operator to comply with all existing State and federal water quality standards.

Pursuant to 33 USC 1371(c)(e), BLM may not impose effluent limitations that are different from those established by EPA. ADEC regulates water quality relating to discharge to the lands and waters of the State, including turbidity and arsenic standards.

7) Alternatives that would redesignate Beaver Creek, including removing the Wild River status of the stream, or changing the drinking water standard to the industrial standard.

These alternatives were not used because they would require action by Congress or the State of Alaska. This was not considered to be a "reasonable" alternative for implementation at this time. This alternative was evaluated in the EIS for the D2 actions which designated Beaver Creek as a National Wild River (DOI 1974) The Wild River status could be reconsidered as a separate action with an attendant EIS.

8) An alternative with no performance standards and no regulation.

This alternative was not used because it would essentially revisit the issue that the 43 CFR 3809 regulations were originally intended to address. The no regulation alternative is the "no action" alternative evaluated in 1980 in the EIS for Surface Management of Public Lands Under the U.S. Mining Laws, 43 CFR 3809 (DOI 1980). A variation of this alternative would set low performance standards, and issue miners a "license" to mine.

2.5 Summary of Environmental Consequences of the Alternatives

This section is a brief summary of the environmental consequences. See Chapter Four for further information and background.

Cumulative Impacts

The evaluation of cumulative impacts requires the integration of time, space, mining/non-mining and federal/non-federal actions in a complex and dynamic environment. This section summarizes the cumulative impacts of multiple placer mines in the Beaver Creek watershed. The spatial aspect is

covered by considering the impacts of multiple mining operations in the headwaters of Beaver Creek (Placer Mining Operations and Access Roads Map, Chapter One). Time is considered by evaluating the past, present, and reasonably foreseeable actions of placer mining. Past and present impacts are part of the existing environment, discussed in detail in Chapter Three, Affected Environment. The projected number of mines, acreages of disturbance, and miles of roads and trails were calculated using methods outlined in Appendix B-1, and are summarized in Figures 2-2, 2-3, and 2-4. Further details on future impacts are discussed in Chapter Four, Environmental Consequences. There are only federal mining claims in this watershed, so impacts from non-federal mines are not of concern. Non-mining actions are discussed in Chapters Three and Four as appropriate.

Figure 2-7 at the end of Chapter Two, illustrates the impacts by showing past, 1987, and projected 1998 impacts for the Proposed Action and each Alternative.

Projection of Mines

Five mines were selected to represent the projected number of placer mines that would operate in the Beaver Creek drainage over the next 10 years under the Proposed Action. Ten years was selected as the time frame for purposes of discussion, not for the period of study of impacts. This number of mines was chosen because it corresponds with the number of mining proposals the Steese/White Mountains District received for the drainage in 1987, and because five mines represents a reasonable estimation of mining activity within the foreseeable future. This level of mining may be a high estimate, since only one mine has operated at any given time over the past six or seven years.

Projecting the number of mines that would operate under Alternatives A, B, and C was based on the compliance costs of these alternatives as compared to the Proposed Action's compliance costs. These costs are listed in Figure 2-6, and a comparison clearly indicates that the estimated water treatment costs for Alternatives A, B, and C are significantly higher than those estimated for the Proposed Action. Due to the significant increase in compliance cost, BLM estimated that only four mines would operate under Alternatives A and B. Similarly, three mines would operate under Alternative C due to increases in water treatment and reclamation costs.

Costs Per Mine	1987 (1 mine)	Proposed Action (5 mines)	Alternatives A (4 mines)	B (4 mines)	C (3 mines)	D (No mines)
Reclamation Cost	$1,500	$3,400	$1,000	$2,000	$3,400	NA
Water Treatment Cost	$1,900	$1,900	$18,100	$18,100	$30,100	NA
BLM Administrative Cost	$1,800	$1,800	$1,400	$2,200	$2,600	See Caption

Figure 2-6. Estimated costs associated with implementation of each alternative. Sources: BLM. EPA. NPS. For Alternative D, validity examinations and appraisals were estimated to cost $2,000 per claim, and the net present value of each claim was estimated to be between $12,000 and $335,000. See Appendix B-3 for methodology for computing costs.

The water treatment costs cited in Figure 2-6 were taken from an EPA report (EPA 1987b) that analyzed the economic impact of effluent standards on the placer mining industry. In the EPA report, six water treatment technology options were outlined and their associated costs for Alaska were estimated. BLM reviewed these options and selected the three treatment technologies that came closest to meeting the various water quality standards of the Proposed Action and Alternatives A, B, and C. It is anticipated that Option Two, a simple settling discharge system composed of several settling ponds would meet the water quality standards, with EPA variances, for the Proposed Action. Alternatives A and B, with water quality standards of .2 ml/l settleable solids and 5 NTU turbidity, and no EPA variances, would require operating with no seepage of effluent to the stream, or the Option Four water treatment technology listed by EPA. Water treatment Option Four consists of several settling ponds and 100% recycle of process water. Alternative C, with water quality standards of zero ml/l settleable solids and zero NTU turbidity increase, would require operations comparable to the Option 6c water treatment technology, that is composed of several settling ponds, 100% recycling of process water, and chemical treatment of mine effluent. The costs in Figure 2-6 represent a mine that processes 50,000 cubic yards per mining season.

A worst-case scenario to describe a level of placer mining more intense than expected was analyzed to predict those possible cumulative environmental impacts. This scenario could occur if unforeseeable circumstances caused this high level of activity, such as the value of gold increasing by several hundred percent. This analysis is presented in Appendix B-2.

2.5.1 Proposed Action

The effects of the Proposed Action are based on five mines operating continuously for the next ten years.

Topography, Mineral Resources, and Soils

There should be no significant cumulative impacts on topography. There would be some short-term modification of site aspect during mining which would not significantly impact the overall topographic setting of the affected area, since the required reclamation would include reconfiguration and stabilization. There should be no significant impacts on mineral resources availability for development.

The soil profile would be completely altered by mining operations on approximately 115 acres. Soil conditions may be impacted by access roads and trails through direct disturbance of the soil profile, enhanced erosion, or from compaction.

Water Resources

Water quantity would not be significantly affected and water quality would return to approximately natural conditions after successful stabilization of the disturbed area and stream channel. Unavoidable adverse impacts would be short-term increases in suspended sediment and turbidity, and accelerated erosion resulting in a possible increase in sediment (360 tons per day) introduced to the

stream system, and changes in channel morphology (1.25 miles) in the vicinity of the disturbed area. Short- and long-term impacts are not expected to be significant downstream on Beaver Creek. The impact on chemical water quality is not expected to be significant.

Landcover and Threatened or Endangered Plants

The vegetation cover would be destroyed in mine and road areas. A short-term loss of productivity is unavoidable. Twenty-eight acres would regrow to a riparian tall shrub community within 25-30 years of reclamation, with an additional 8.6 acres within 50 years on mining disturbance in creek bottoms. Sixty-four acres of new mining disturbance would remain barren or sparsely vegetated.

There are no "listed" or "candidate" threatened or endangered plant species within the watershed. Mining and associated activities would have no known direct effect upon the one endemic plant specie involved, *Poa porsildii.*

Wildlife

Approximately 676 acres of wildlife habitat would be physically altered due to mining related activities. Periodic disturbances to wildlife due to the operation of vehicles and machinery, and human habitation affecting 38,420 acres could result in a low to moderate level of short-term cumulative effects. The principal long-term adverse effect of mining would be the unavoidable loss of approximately 115 acres of the moose winter range habitat for a 25-35 year period. The long-term cumulative loss of habitat to mining activities in these areas and adjacent State lands would probably contribute to a low to moderate reduction in moose population potential. The potential exists for long-term cumulative adverse effects to wildlife if mining activity and human use of the area increase greatly in crucial wildlife habitats.

There are five to eight nests for peregrine falcon in the watershed. Protective measures would be required for any mining activity planned within one mile of these nests. No anticipated mining activities are within the boundaries set by the protective measures.

Fisheries

Direct effects on fish habitat from water quality changes caused by mining development activities would be alleviated through adherence to standards and use of mitigation measures. Reclamation measures to restore stream channels and construct habitat to enhance fish populations within the disturbed streams would alleviate potential sedimentation, turbidity, and degradation of available fish habitat. Unavoidable adverse impacts would be increased sedimentation, turbidity, and erosion from disturbed areas of active mining. Following reclamation and stream enhancement construction, these impacts would cease.

Cultural Resources and Subsistence

Cumulative impacts on cultural resources in the Beaver Creek drainage do not appear to be significant.

The upper portion of Beaver Creek drainage is not notably used for subsistence purposes now nor has it been in the recent past. Subsistence activities, including hunting, trapping, and fishing are pursued in the lower Beaver Creek drainage by residents of area villages. There is no indication, however, that past or present (1987) mining in upstream areas has significantly restricted subsistence uses or resources along the river. There are no communities downstream from mining which rely on Beaver Creek for drinking water. While some opportunities for more hunting, fishing, and trapping may result from improved access into the headwaters of Beaver Creek, those activities would be regulated by the Alaska Department of Fish and Game (ADF&G). Much of any new use likely would be by non-subsistence persons, with hunting, if any, affecting game stocks distinct from those harvested downstream for subsistence purposes. Ongoing trapping and berry picking are generally not significantly impacted by mining activities and are not being done in the upper portions of Beaver Creek drainage by any documented village-based subsistence users.

Recreation and Visual Resources

Projected route construction would provide more opportunities for most types of motorized recreation, and would also indirectly provide additional opportunities for non-motorized recreation by improving access. These impacts are positive, since they complement existing management plans. Minor negative impacts would be caused by the visual effect of mining operations on the quality of primitive recreation opportunities. A very slight reduction in summer trail riding opportunities for small ORVs would be a negligible adverse impact. A potential short-term reduction in the quality of fishing opportunities could be offset by enhancement of these opportunities over the long term.

Visual resources would be reduced slightly by the increased road mileage and mining operations. No mining would occur along the Wild and Scenic River Corridor.

Economics

If the total number of mines increased from one to five, direct employment would increase by 38 work months per year, and annual wages would increase by an estimated $45,000.

Annual costs for water treatment and reclamation for all five mining operations would be $9,500 and $17,000 respectively. Administration and enforcement of the Surface Management Program for placer mining would cost BLM about $9,000 annually (all values in 1987 dollars). Figure 2-6 is a summary of the estimated cost, per mine, associated with the implementation of each alternative.

2.5.2 Alternative A

The effects of this alternative are based on four relatively small mines which would operate continuously for the next ten years.

Topography, Mineral Resources, and Soils

There should be no significant cumulative impacts on topography. There would be some short-term modification of site aspect during mining. There may be discernible modifications of overall landscape aspect, since reclamation requirements would only stabilize disturbed areas. The scale of these alterations in aspect would be relatively small.

There should be no significant impacts on mineral resources, in terms of availability for development.

The soil profile will be completely altered by mining operations on approximately 100 acres. Soil conditions may be impacted by access roads and trails through direct disturbance of the soil profile, enhanced erosion, or compaction.

Water Resources

Water quantity would not be significantly affected and water quality would return to approximately natural conditions after successful stabilization of the disturbed area and stream channel. Unavoidable adverse impacts would be short- to long-term increases in suspended sediment and turbidity, and accelerated erosion resulting in a possible increase in sediment introduced to the stream system, and changes in channel morphology (one mile) in the vicinity of the disturbed area. Expected sediment load rate per acre would be greater than for the Proposed Action, but the difference between sediment rates is not predictable without suitable sedimentation studies. Short- and long-term impacts are not expected to be significant downstream on Beaver Creek. The impact on chemical water quality is not expected to be significant.

Landcover

The vegetation cover would be destroyed in the areas of the mines and roads. A short-term loss of productivity would be unavoidable. Twelve acres would regrow to a riparian tall shrub community within 30 years of reclamation, and an additional 7.5 acres within 50 years on mining disturbance in creek bottoms. Eighty acres of new mining disturbance would remain barren or sparsely vegetated.

There are no "listed" or "candidate" threatened or endangered plant species within the watershed. Mining and associated activities have no known direct effect upon the one endemic plant specie involved, *Poa porsildii.*

Wildlife

Approximately 634 acres of wildlife habitat will be physically altered by mining and related activities. Periodic disturbances to wildlife due to the operation of vehicles and machinery, and human habitation affecting 33,348 acres could result in a low to moderate level of short-term cumulative effects. The principal long-term adverse effect of mining will be the unavoidable loss of approximately 100 acres of the moose winter range habitat for a 50 year period. The long-term cumulative loss of habitat to mining activities in these areas and adjacent State lands will probably contribute to a low

to moderate reduction in moose population potential. The potential exists for long-term cumulative adverse effects to wildlife if mining activity and human use of the area increases greatly in crucial wildlife habitats.

There are five to eight nests for peregrine falcon in the watershed. Protective measures would be required for any mining activity which is planned within one mile of these nests. No anticipated activities are within the boundaries set by these protective measures.

Fisheries

Direct effects on the fish habitat from water quality changes caused by mining development activities would be alleviated through adherence to standards and use of mitigation measures. Unavoidable adverse impacts from sediment would reduce fish habitat and fish populations and opportunities for sport fishing in areas below mining; but upon cessation of the mining operations and completion of reclamation, these short-term effects would cease. There would be no irreversible commitments of the fishery resources.

Cultural Resources and Subsistence

Cumulative impacts on cultural resources in the Beaver Creek drainage do not appear to be significant.

Subsistence activities and resources in the lower Beaver Creek drainage would not be significantly restricted, if at all, by mining under this alternative. Potential impacts to fish, wildlife, and water quality would be mitigated in the upstream areas where mining occurs so that any impacts would be negligible in subsistence use areas. As a result, no cumulative impacts would be likely to occur.

Recreation and Visual Resources

Projected route construction would provide more opportunities for most types of motorized recreation, and would also indirectly provide additional opportunities for non-motorized recreation by improving access. These impacts are positive, since they complement existing management plans. Minor negative impacts would be caused by the visual effect of mining operations on the quality of primitive recreation opportunities, a potential short- term reduction in fishing opportunities, and a moderate reduction in summer trail riding opportunities for small ORVs.

Visual resources would be reduced slightly by the increased road mileage and mining operations. No mining would occur along the Wild and Scenic River Corridor.

Economics

If the total number of mines increased from one to four, direct employment would increase by about 30 work months per year and annual wages would increase by an estimated $34,000.

Annual costs for water treatment and reclamation for all four mining operations would be $72,400 and $4,000 respectively. Administration and enforcement of the Surface Management Program for placer mining would cost BLM about $6,000 annually (all values in 1987 dollars).

2.5.3 Alternative B

The effects of this alternative are based on four relatively small mines which would operate continuously for the next ten years.

Topography, Mineral Resources, and Soils

There should be no significant cumulative impacts on topography. There would be some short-term modification of site aspect during mining which would not significantly impact the overall topographic setting of the affected area, since the required reclamation would include reconfiguration and stabilization.

There should be no significant impacts on mineral resources in terms of availability for development.

The soil profile would be completely altered by mining operations on approximately 100 acres. Soil conditions may be impacted by access roads and trails through direct disturbance of the soil profile, enhanced erosion, or compaction.

Water Resources

Water quantity would not be significantly affected and water quality would return to approximately natural conditions after successful stabilization of the disturbed area and stream channel. Unavoidable adverse impacts would be short- to long-term increases in suspended sediment and turbidity, and accelerated erosion resulting in a possible increase in sediment introduced to the stream system, and changes in channel morphology (one mile) in the vicinity of the disturbed area. The sediment load rate per acre is estimated to be greater than the Proposed Action, but less than Alternative A. Short- and long-term impacts are not expected to be significant downstream on Beaver Creek. The impact on chemical water quality is not expected to be significant.

Landcover

The vegetation cover would be destroyed in mine and road areas. A short-term loss of productivity would be unavoidable. Twenty-five acres would regrow to a riparian tall shrub community within 30 years of reclamation, with an additional 7.5 acres within 50 years on mining disturbance in creek bottoms. Sixty-eight acres of new mining disturbance would remain barren or sparsely vegetated.

There are no "listed" or "candidate" threatened or endangered plant species within the watershed. Mining and associated activities have no known direct effect upon the one endemic plant specie involved, *Poa porsildii.*

Wildlife

Approximately 634 acres of wildlife habitat would be physically altered by mining and related activities. Periodic disturbances to wildlife due to the operation of vehicles and machinery, and human habitation affecting 33,348 acres could result in a low to moderate level of short-term cumulative effects. The principal long-term adverse effect of mining would be the unavoidable loss of approximately 100 acres of moose winter range habitat for a 30 to 50 year period. The long-term cumulative loss of habitat to mining activities in these areas and adjacent State lands would probably contribute to a low to moderate reduction in moose population potential. The potential exists for long-term cumulative adverse effects to wildlife if mining activity and human use of the area increases greatly in crucial wildlife habitats.

There are five to eight nests for peregrine falcon in the watershed. Protective measures would be required for any mining activity planned within one mile of these nests.

Fisheries

Direct effects on fish habitat from water quality changes caused by mining development activities would be alleviated through adherence to standards and use of mitigation measures. Unavoidable adverse impacts from sediment would reduce fish habitat, fish populations, and opportunities for sport fishing in areas below mining; but upon cessation of the mining operations and completion of reclamation, these short-term effects would cease. There would be no irreversible commitments of the fishery resources.

Cultural Resources and Subsistence

Cumulative impacts on cultural resources in the Beaver Creek drainage do not appear to be significant.

Subsistence activities and resources in the lower Beaver Creek drainage would not be significantly restricted, if at all, by mining under this alternative. Potential impacts to fish, wildlife, and water quality would be mitigated in the upstream areas where mining occurs so that any impacts would be negligible in subsistence use areas. As a result, no cumulative impacts are likely to occur.

Recreation and Visual Resources

Projected route construction would provide more opportunities for most types of motorized recreation, and would also indirectly provide additional opportunities for non-motorized recreation by improving access. These impacts are positive, since they complement existing management plans. Minor negative impacts would be caused by the visual effect of mining operations on the quality of primitive recreation opportunities, a potential short-term reduction in fishing opportunities, and a moderate reduction in summer trail riding opportunities for small ORVs.

Visual resources would be reduced slightly by the increased road mileage and mining operations. No mining would occur along the Wild and Scenic River Corridor.

Economics

If the total number of mines increased from one to four, direct employment would increase by about 30 work months per year and annual wages would increase by an estimated $34,000.

Annual costs for water treatment and reclamation for all four mining operations are $72,400 and $8,000 respectively. Administration and enforcement of the Surface Management Program for placer mining will cost BLM about $9,000 annually (all values in 1987 dollars).

2.5.4 Alternative C

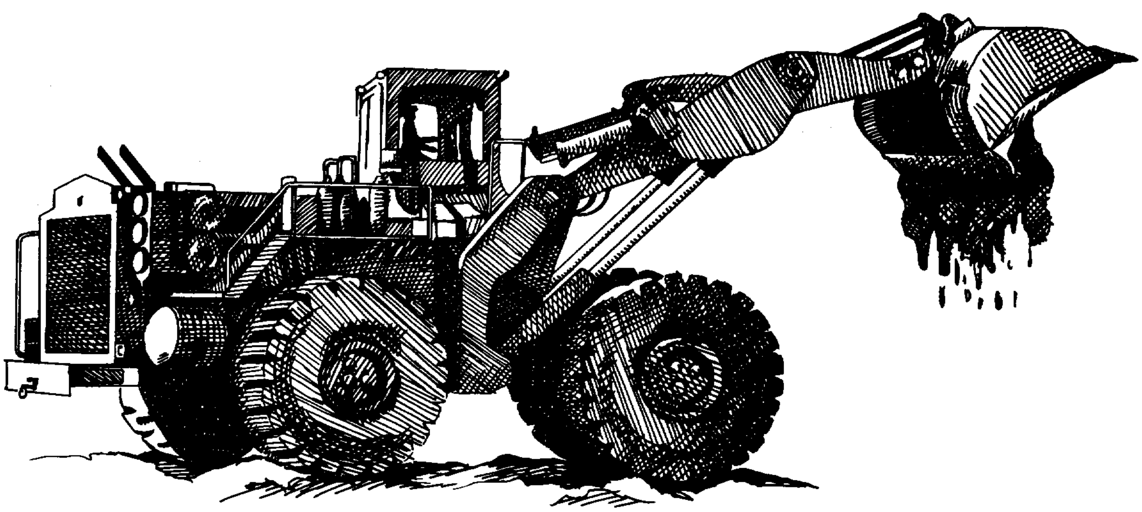
The effects of this alternative are based on three mines operating continuously for the next ten years.

Topography, Mineral Resources, and Soils

There should be no significant cumulative impacts on topography. There would be some short-term modification of site aspect during mining which would not significantly impact the overall topographic setting of the affected area, since the required reclamation would include reconfiguration and stabilization.

There should be no significant impacts on mineral resources.

The soil profile would be completely altered by mining operations on approximately 84 acres. Soil conditions may be impacted by access roads and trails through direct disturbance of the soil profile, enhanced erosion, or compaction.



Front-end Loader

Water Resources

Water quantity would not be significantly affected and water quality would return to approximately natural conditions after successful stabilization of the disturbed area and stream channel. Unavoidable adverse impacts would be short-term increases in suspended sediment and turbidity, and accelerated erosion resulting in a possible increase in sediment introduced to the stream system, and changes in channel morphology (.75 miles) in the vicinity of the disturbed area. The sediment load rate per acre would be slightly reduced from that of the Proposed Action; due to stricter water quality performance standards. Short- and long-term impacts are not expected to be significant downstream on Beaver Creek. The impact on chemical water quality is not expected to be significant.

Landcover

The vegetation cover would be destroyed in mine and road areas. A short-term loss of productivity would be unavoidable. Twenty-one acres would regrow to a riparian tall shrub community within 25 years of reclamation, with an additional 16.5 acres within 50 years on mining disturbance in creek bottoms. Forty-seven acres of new mining disturbance would remain barren or sparsely vegetated.

There are no "listed" or "candidate" threatened or endangered plant species within the watershed. Mining and associated activities have no known direct effect upon the one endemic plant specie involved, *Poa porsildii.*

Wildlife

Approximately 589 acres of wildlife habitat would be physically altered by mining and related activities. Periodic disturbances to wildlife due to the operation of vehicles and machinery, and human habitation affecting 27,972 acres could result in a low to moderate level of short-term cumulative effects. The principal long-term adverse effect of mining would be the unavoidable loss of approximately 100 acres of the moose winter range habitat for a 25-35 year period. The long-term cumulative loss of habitat to mining activities in these areas and adjacent State lands would probably contribute to a low to moderate reduction in moose population potential. The potential exists for long-term cumulative adverse effects to wildlife if mining activity and human use of the area increases greatly in crucial wildlife habitats.

There are five to eight nests for peregrine falcon in the watershed. Protective measures would be required for any mining activity planned within one mile of these nests. No anticipated mining activities are within the boundaries set by these protective measures.

Fisheries

Direct effects on fish habitat from water quality changes caused by mining development activities would be alleviated through adherence to standards and use of mitigation measures. Reclamation measures to restore stream channels and construct habitat to enhance fish populations within the disturbed streams would alleviate potential sedimentation, turbidity, and degradation of available fish

habitat. Unavoidable adverse impacts would be increased sedimentation, turbidity, and erosion from disturbed areas of active mining. Following reclamation and stream enhancement construction, these impacts would cease.

Cultural Resources and Subsistence

Cumulative impacts on cultural resources in the Beaver Creek drainage do not appear to be significant.

Subsistence activities and resources in the lower Beaver Creek drainage would not be significantly restricted, if at all, by mining. Potential impacts to fish, wildlife, and water quality would be mitigated in the upstream areas where mining occurs so that any impacts would be negligible in subsistence use areas. As a result, no cumulative impacts are likely to occur.

Recreation and Visual Resources

Projected route construction would provide more opportunities for most types of motorized recreation, and would also indirectly provide additional opportunities for non-motorized recreation by improving access. These impacts are positive, since they complement existing management plans. Minor negative impacts would be caused by the visual effect of mining operations on the quality of primitive recreation opportunities, and a moderately large reduction in summer trail riding opportunities for small ORVs. A potential short-term reduction in fishing opportunities could be offset by enhancement of these opportunities over the long-term.

Visual resources would be reduced slightly by the increased road mileage and mining operations. No mining would occur along the Wild and Scenic Corridor.

Economics

If the total number of mines increased from one to three, estimated total annual employment would increase by about 22 work months and annual wages (income) would increase by an estimated $25,000.

Annual costs for water treatment and reclamation for all three mining operations are $90,300 and $10,000 respectively. Administration and enforcement of the Surface Management Program for placer mining will cost BLM approximately a total $8,000 annually (all values in 1987 dollars).

2.5.5 Alternative D

The effects of this alternative are based on no further placer mining disturbances being allowed in the watershed.

Topography, Mineral Resources, and Soils

Cessation of mining would end further short- and long-term impingements upon topography.

Placer mining activity would cease and related mineral resources would remain undeveloped.

No further soil disturbance would occur due to mining and there would be no further irretrievable or irreversible commitment of soil resources.

Water Resources

Erosion from unreclaimed areas may introduce sediment into the stream system, particularly during periods of high flow. There would be no irreversible or irretrievable commitment of water resources and no effect on long-term productivity.

Landcover

The vegetation cover has been destroyed on mine sites and roads, resulting in a short-term unavoidable loss of productivity. There is a long-term unavoidable loss of 300 acres of the vegetation cover in the area from historic mines.

There are no "listed" or "candidate" threatened or endangered plant species within the watershed.

Wildlife

Approximately 300 to 320 acres of moose winter range would remain lost because of past physical alterations. Disturbances to wildlife from mining vehicles, machinery, and human habitation in the Beaver Creek watershed would cease. Recreation use of existing roads and trails would facilitate increased harvest of wildlife. The principal long-term adverse effect of past mining would be the unavoidable loss for approximately 50 years of 33% of the previously disturbed moose winter range in the Nome Creek watershed.

The five to eight nests for peregrine falcon in the watershed would not be effected.

Fisheries

There would be no further fisheries impacts except effects on habitat from non-point source erosion from unreclaimed areas.

Cultural Resources and Subsistence

Cumulative impacts on cultural resources in the Beaver Creek drainage do not appear to be significant.

Subsistence activities and resources in the lower Beaver Creek drainage would not be significantly restricted, since no mining would occur. Potential impacts to fish, wildlife, and water quality would be avoided so that no impacts would occur in subsistence use areas. As a result, no cumulative impacts would occur.

Recreation and Visual Resources

The quality of floatboating opportunities would be marginally enhanced by a reduction in the frequency of noticeably turbid stream flow in the upper reaches of the Beaver Creek watershed.

Visual resources would remain the same as they are today.

Economics

If the only mine in the watershed were to shut down, annual employment would decrease by an estimated two work months and annual wages (income) would decrease by almost $3,000.

Validity exams on all properly filed claims will cost the BLM approximately $262,000 to complete, and the estimated net present value of the claims is between $1,572,000 and $44,000,000 (Appendix B-3).

Components	Past <1981	Present 1987	Proposed Action 1989-1998
Number of Mines Acreage Disturbed Acreage Reclaimed	Unknown 352 40	1 3 3	5 115 80
Topography Minerals	300 acres tailings *NSI on development	NSI NSI on development	NSI NSI on development
Soils: -Acres of soil disturbed	352	3	115
Water Resources: -Channel morphology miles -Sediment load (tons/day) -Toxic substances	8 Unknown NSI	.25 Unknown NSI	1.25 360 NSI
Landcover: -Acres Permanently barren from mining -Years to regrow to shrub community -Threatened & endangered plants	300 50 Unknown	2.50 50 None perceived	64 25-35 None expected
Wildlife: -Acres of habitat subject to disturbance/disruption -Acres of habitat lost for x years -Acres of habitat physically altered (total) -Threatened & endangered animals	20,524 352 acres/unknown yrs. 352 NSI	20,524 2.5 acres/50 yrs. 352 NSI	38,420 115 acres/25-35 yrs. 676 NSI
Fisheries: -Fish populations	Unknown	Short term impacts	Short term impacts
Cultural & paleontological resources	Mining created historical sites	No new sites discovered	No change in impacts
Subsistence	Minor impacts only, not significant	None	None
Recreation & visual resources: -Estimated recreation use	Unknown	18,200 Visitor use days	Increase, unknown magnitude
Economics: -Direct mining related employment-work months -Annual direct mining related income	Unknown Unknown	2 $3,000	40 $48,000

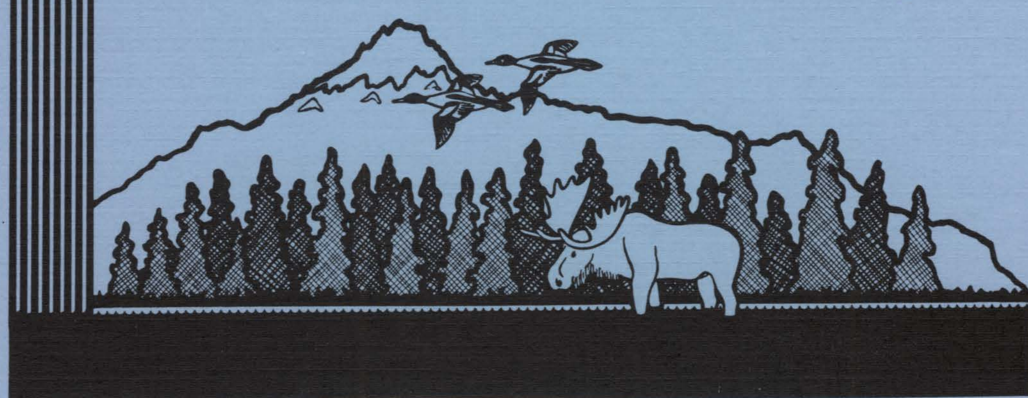
*NSI - No Significant Impacts

Figure 2-7. Summary and comparison of pre-1981 impacts with those of the 1987 mining season and projected 1998 impacts under the proposed action and the alternatives. For expanded discussion see chapter 4 and Appendix B-1.

Alternative A 1989-1998	Alternative B 1989-1998	Alternative C 1989-1998	Alternative D 1989-1998
4 100 70	4 100 70	3 84 58	0 0 0
Minimal impacts NSI on development	NSI NSI on development	NSI NSI on development	No further impacts No further mining
100	100	84	0
1 Greater than P.A. NSI	1 Greater than P.A. Less than Alt. A NSI	.75 Less than P.A. NSI	0 0 NSI
80 50 None expected	68 30-50 None expected	47 25-30 None expected	No new disturbance Not applicable None expected
33,348 100 acres/50 yrs. 634 NSI	33,348 100 acres/30-50 yrs. 634 NSI	27,972 100 acres/25-35 yrs. 589 NSI	20,524 40 acres/50 yrs. 352 NSI
Short term impacts	Short term impacts	Minimal impacts	No further impacts
No change in impacts	No change in impacts	No change in impacts	No further impacts
None	None	None	None
Increase, unknown magnitude	Increase, unknown magnitude	Increase, unknown magnitude	Increase, unknown magnitude
32 $37,000	32 $37,000	24 $28,000	0 0

Chapter III
Affected Environment

CHAPTER MAPS



BEAVER CREEK

Introduction

This chapter profiles the environmental resources in the Beaver Creek drainage within the White Mountains National Recreation Area. It is not intended to be an encyclopedic description, rather it discusses the physical, biological, social, and economic materials and conditions that would change under the implementation of the Proposed Action or an alternative, and thus may aid a reader in understanding the alternatives.

The relation of human activity to the physical elements of the environment is expressed as changes in earth, water, flora, fauna, and the socioeconomic system. For each resource, the term "cumulative effects" probably has a special and sometimes unique meaning or usage. This chapter discusses the past and present impacts to the environment. Chapter Four looks at the future under various alternatives and assess the cumulative impacts of placer mining.

Three of the required elements (Areas of Critical Environmental Concern, Farm Land, and Wilderness) listed in Chapter One (Section 1.8) were not discussed or analyzed in this chapter because such resources do not exist within the affected area. A fourth element, Air Quality, is only discussed here in the introduction.

Air Quality

There is currently no quantitative information on air quality for this watershed. Because there are few industrial operations or metropolitan centers in the area, it is assumed the only pollutant sources are fugitive dust from travel on gravel roads, forest fires, and localized smoke from cabins. Occasional large forest fires in Interior Alaska can cause short-term air quality problems such as reduced visibility and discomfort over large areas. In general, however, the air quality in the area is assumed to be excellent on observational evidence. Under all alternatives there are no anticipated long-term or cumulative impacts to the air quality in the area. Very localized deterioration of air quality will occur in the immediate vicinity of internal combustion engines employed by mining operations. Dispersion of exhaust will quickly make levels of pollution undetectable.

General Considerations and Interrelationships Among Geology, Soils, and Sediments

The intent of this section is to briefly consider those geologic properties and controlling processes that occur at or near the earth's surface. What should be appreciated in particular are the interrelationships among physical substrates, erosion, and the properties of soils (Section 3.3) and other surficial materials, as well as the relationships to other aspects of the environment. Mineral resources (Section 3.2) are an additional fundamentally related concern.

The set of processes collectively known as erosion involve the detachment and transport of materials from place to place on and adjacent to the land surface. These processes are active in different areas and at different rates, depending on such factors as the mechanical strength of materials, climate conditions, local geology and topography, and vegetation.

Erosion, as used here, includes both the movement of products by the transport agents, and their temporary or permanent deposition. Water, particularly streams, is the most important transport agent. The products of erosion are transported in streams as dissolved load, suspended sediment, and bedload.

These natural processes have various effects. For example, continual erosion replenishes the stream gravels necessary for a viable fishery. However, some mining practices tend to enhance erosion processes. Accelerated erosion is caused by exposure of soil and by loss of vegetation cover, with a resultant decrease in the ability of the soil substrate to naturally regenerate. Additionally, deposition of the eroded materials may occur in places where it is unwanted and/or in excessive volumes, especially in streams where it can adversely affect downstream resources and uses. Disturbance or removal of permafrost may locally enhance biological productivity, although such actions also encourage erosion.

Because of these various effects, it is desirable to avoid or control mining practices that accelerate erosion, or at least to ameliorate their effects. Erosion may be divided into two general types, here termed surface erosion and mass movement.

Surface erosion refers to the movement of individual soil particles in response to gravity and/or fluid flow.

These processes are usually minor in vegetated or undisturbed lands, although storm events or snowmelt runoff may overwhelm the ability of the land to accommodate the water, and may temporarily increase surface erosion. Surface erosion becomes important when land is disturbed either by nature (wildfires, landslides) or by human activities such as mining or road construction.

Mass movement is a general term for a group of processes by which a fairly large volume of earth is moved at various rates of speed under the influence of gravity. A fluid may or may not be involved, but rates of occurrence and velocities are usually increased by the presence of a fluid. Mass movement is generally caused by long-term weathering and reduction of strength, but individual occurrences are usually precipitated by environmental events such as heavy rainstorms.

Under natural and disturbed conditions, mass movement processes are, in the short-term, the most significant means of erosion in terms of environmental considerations. Debris torrents are perhaps the most important erosional agent because of their long reach, their ability to damage downstream structures and resources, and the long periods required for channel recovery.

General Soil Properties

Soil characteristically consists of a layer of organic material underlain by several layers or "horizons" of mineral soil. The properties of each horizon vary as a result of the interplay of soil-forming processes; in particular climate, vegetation, and topography. These act on the parent material over time.

Weathering of rock-forming minerals at the earth's surface is the first step in soil formation. Chemical weathering along with physical weathering form the more stable clay minerals, concentrate iron and aluminum oxides, and release the major plant nutrients such as potassium, phosphorus, and sulfur. This contributes to the solute composition of the soil water, and ultimately of groundwater and streamwater.

Soil fertility and its contribution to productivity depend upon the physical, chemical, and biological properties of the soils.

Soil Physical Properties

Soil physical properties control the drainage and availability of soil, water, and air to the root zone, affecting both root growth and nutrient movements. Physical soil properties include texture, structure, and density. Texture refers to the relative abundance of sand, silt, and clay-sized particles in the soil, and is often used as an approximate indicator of potential vegetation productivity. Structure is the spatial arrangement and bonding together of soil particles, and is important to drainage, aeration, and erosion resistance. Density refers to the soil's relative compactness, and is important to root distribution and water retention.

Vegetation and related soil biological processes are very important to the development of soil physical properties. Development of soil organic matter contributes to water-holding capacity, maintains aggregate stability, and improves soil resistance to erosion. This organic matter is an energy source for the micro- and macroorganisms that play an active role in controlling both chemical and physical soil properties. Any change in the quality or quantity of vegetation, air temperature, water regime, or a host of other environmental variables will cause a change in soil physical properties.

The most direct changes to physical properties caused by mining practices are probably compaction or change in the soil's bulk density, and direct disruption of the structure.

Soil Chemical Properties

Soils are generally composed of some 15 chemical elements. Of these, seven (iron, calcium, potassium, magnesium, phosphorus, sulfur, and manganese) are particularly important plant nutrients derived from soil weathering.

Soil chemical properties can be affected by any mining practice that tends to change the dissolved ionic composition of the soil water. Of particular concern are removal of nutrients or losses which exceed replenishment, as well as persistent changes to processes that control rates at which soil nutrients are made available to plants.

Soil Biological Properties

Soil biology refers to the organisms that inhabit the soil. Most contribute to beneficial processes such as weathering of parent material, soil aggregation, organic matter decomposition, nitrogen transformation and fixation, retention of other substances that would otherwise be lost by leaching, and protection of roots from pathogens.

Growth and activity of soil organisms are affected by water, temperature, aeration, acidity, food supply, and biological factors. In undisturbed lands, populations of soil organisms reach a dynamic equilibrium; seasonal changes occur, but annual populations are relatively stable. Major site disturbances disturb this equilibrium.

Human activities such as mining practices, as well as various natural events may affect these processes through physical soil disturbance and modification or removal of vegetation.

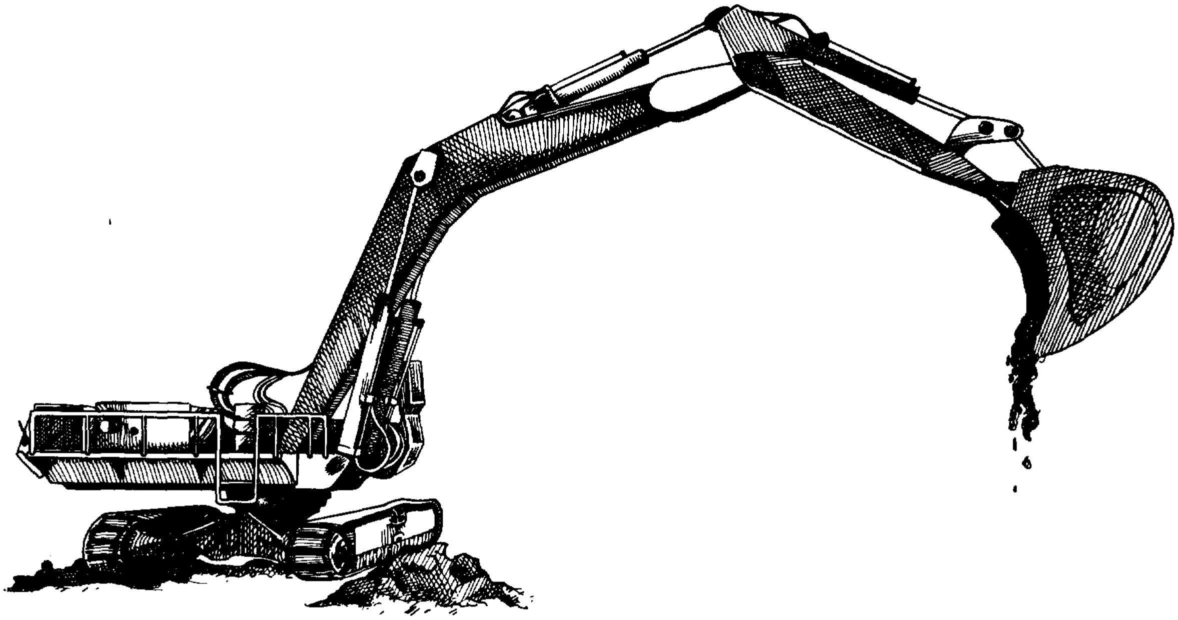
3.1 Geology and Topography

The Beaver Creek watershed study area lies within the Livengood, Circle, Fort Yukon, and Beaver quadrangles, as mapped at a scale of 1:250,000 by the U.S. Geological Survey (USGS).

Much of the following discussion in this Section and Section 3.2 is based on or has been freely excerpted from several key references. A principal source for more in-depth treatment is the "Administrative Report on the Mineral Resource Assessment for Part of the White Mountains National Recreation Area, Alaska," prepared for the BLM by the USGS (USGS 1987a). The other relevant references used are "Mineral Assessment of the Lime Peak - Mt. Prindle Area, Alaska," prepared by the State of Alaska, Division of Geological and Geophysical Surveys, 1987 (ADGGS 1987), covering portions of the WMNRA, as well as portions of the Steese National Conservation Area immediately to the east of the WMNRA; "Alaska Regional Profiles: Yukon Region," prepared by the University of Alaska, Arctic Environmental Information and Data Center (Selkregg 1974); "The Alaska Mineral Resource Assessment Program: Background Information to Accompany Folio of Geologic and Mineral Resource Maps of the Circle Quadrangle Alaska," (USGS 1987b); and maps and text of USGS Open File Report 83-170-A,B,C (USGS 1983) on the Circle quadrangle. These references include extensive lists of previously published information, and should be consulted for this purpose, as well as for more detailed discussions of the geology, topography, and mineral resources of the study area. Included as Appendix C-1 is a generalized version of the geologic time scale.

The Beaver Creek Watershed and the White Mountains NRA

A major portion of the Beaver Creek watershed lies within the WMNRA. This area is part of the Yukon-Tanana Upland physiographic province, which is a semi-mountainous area in east-central Interior Alaska, bounded by the Yukon and Tanana Rivers. The WMNRA is approximately 1,150 square miles in area, and contains a variety of topographic features. It includes most of the upper drainage of Beaver Creek. From its headwaters near Mt. Prindle (elevation 5286 feet), Beaver Creek flows across the WMNRA in a generally westerly direction, before turning northward to con-



Excavator

tinue into the Yukon Flats and its eventual confluence (at approximately 380 feet elevation) with the Yukon River. The course of Beaver Creek thus defined extends about 303 miles. Major tributaries include Nome Creek, Bear Creek, Wickersham Creek, Fossil Creek, Willow Creek, and Victoria Creek (Tributaries and Main Physical Features Map, Chapter One).

The Yukon-Tanana Upland is underlain by a variety of metamorphic, sedimentary, and volcanic rocks, which are transected locally by granitic rocks, some occurrences of which are of batholithic dimensions. The WMNRA is made up of a variety of bedrock types, which are juxtaposed structurally in a moderately complex manner. The principal disruptive structural features include major thrust faults, and strike - slip faults related to the Tintina Fault Zone. The Tintina Fault Zone is a very large-scale zone of regional faulting, hundreds of miles in surface-length, and of fundamental significance to the overall geologic framework of Interior Alaska. A portion of this zone extends along a northwest-southeast trend across the northern part of the study area. The bedrock underlying the WMNRA ranges from Precambrian to Tertiary in age, and consists of quartzitic, pelitic, calcic, and mafic sedimentary and metasedimentary rocks, as well as some mafic and felsic metaigneous rocks. These have been extensively intruded by younger (Mesozoic and Cenozoic) magmas which resulted in the formation of appreciable amounts of granitic rocks, as well as minor amounts of intermediate and mafic igneous rocks.

The White Mountains proper consist of a relatively narrow area underlain by bedded volcanic rocks and limestones which form an area of rugged relief in the core of the WMNRA. The White Mountains are so-named due to the constituent light-colored Tolovana limestone bedrock unit, which when illuminated under bright sunlight contrasts strongly with the adjacent darker-colored Fossil Creek Volcanics unit. The highest elevation is in the northern part of the White Mountains, 4,163 feet at the peak designated "VABM Fossil." In places the limestone beds are oriented nearly vertically, in the

axes of narrow bedrock folds, and erode to form spectacular topographic features such as crags and spires. One such place, north of Windy Gap, has been called "The High Jags." A natural arch, "Windy Arch," occurs in limestone on the southeast side of Windy Gap.

Other prominent topographic features in the study area include Victoria Mountain (4,588 feet), which stands high above the east end of the ridge between Beaver and Victoria Creeks. Relief in the vicinity of Beaver Creek is some 3,700 feet. Cache Mountain, south and east of the White Mountains, has an elevation of 4,772 feet. Several prominences in excess of 5,000 feet occur on the crest of a ridge which extends to the northeast from Cache Mountain. This trend includes Rocky Mountain (5,062 feet). Mt. Schwatka is a flat-topped prominence which reaches 4,177 feet in elevation in the northern part of the area, adjacent to the Yukon Flats.

Although the upland areas in the WMNRA are neither exceptionally high nor very extensive, there is evidence of Pleistocene glaciation, particularly in the vicinity of Cache Mountain, Victoria Mountain, and to some extent on the north side of the White Mountains. All of the streams originating on Cache Mountain have the U-shaped profile in their upper reaches typical of a glacially eroded valley. The evidence (valley form, location of fragmental moraine and outwash deposits) suggests that at least three major glacial episodes (Early ? Pleistocene - Early ? Wisconsin) modified the topography of Cache Mountain and the ridge extending northeast toward Rocky Mountain (Lime Peak). During the period of maximum glaciation, perhaps some 65% of the mountainous area in the vicinity of Cache Mountain may have been covered with perennial ice and snow, and a small ice cap may have covered the top of Cache Mountain. Glaciation also occurred on Victoria Mountain, but was less extensive, since it is not quite so high as Cache Mountain, and is more isolated from other high terrain, hence less prone to accumulate and retain snow and ice. At least one small glacier formed at the head of Lost Horizon Creek, as well as across several divides to the east, in the northern part of the White Mountains.

During the Pleistocene, large volumes of water discharged from glaciers in the mountains eroded the existing land surface to form a prominent terrace along Beaver Creek. Terraces of similar origin occur on Nome Creek, Bear Creek, O'Brien Creek, Fossil Creek, Willow Creek, and to a small extent on lower Victoria Creek. Simultaneously, large amounts of outwash material, principally gravels, were dumped into these drainages. Some of these gravels are gold-bearing, and in some appropriate positions natural concentrations of gold resulted, forming placer deposits. Some of these have been recognized and mined, particularly in the Nome Creek area. These outwash gravels of old floodplains subsequently were covered by reworked silt and organic materials. The resultant topography is rather flat; the ground is poorly-drained and is presently frozen, with visible ice-wedge features in many places. Such permafrost conditions are pervasive throughout the study area, since the entire Interior Alaska region is within the zone of discontinuous permafrost (cf. Williams 1970). Specific relationships with permafrost in any given site result from a complex array of geologic and topographic factors.

Mertie (1937) discusses the nature, distribution, and origins of the various Pleistocene - Recent surficial deposits recognized within the Yukon-Tanana Upland:

"...earliest Pleistocene deposits consist of silt, sand, and gravel ... These deposits occur in many different sites in the present valleys. Some of them lie 200 feet or more below the present surface.... Others occur on stream terraces, well above the present valley floors. At some places they lie deeply buried in old channels, separated from the present stream channels by bedrock reefs; and at other places the old and the new valleys have nearly the same courses, so that the present streams are now dissecting the older gravel. Many of the richer gold placers in the Yukon-Tanana region occur in these older deposits.... These older deposits occur in all the principal mining areas of the region, including the Fairbanks, Hot Springs, Rampart, Circle, Seventymile, and Fortymile districts....

"After the deposition of the older Quaternary gravel there began, in this region, a different type of sedimentation. Most of the older gravel deposits are overlain by a varying thickness of silt, containing much vegetal material. This silt is black when wet but is light to dark gray after the moisture has been removed.... Some evidence leads to the belief that a considerable part of this material is wind-borne. At the top of such deposits, and locally in layers throughout them, the silt is mingled with much vegetal material, which gives it a black color; and locally beds of peat form a part of the sequence. These deposits of silt containing considerable vegetal material are called "muck" by the miners; but because all the silt is dark- colored when wet the term "muck" is loosely applied to all the dark-colored silts.

"These silt deposits, as well as the gravel below them, are usually frozen in whole or in part in Interior Alaska. The silt, however, is much more likely to be solidly frozen than the gravel. It also contains beds and lenses of clear ice, practically free of sediment, which are believed in large part to have formed after the original deposition of this material. These beds of silt in some localities are only a few feet thick, but in other places, as in the Fairbanks district, they may have a thickness of 100 feet or more. The silt beds are not uniform in character throughout, for mining has shown the presence in them of inlaid lenses of grit or even gravel, showing that conditions of alluvial accumulations were by no means uniform, even at any one locality. Such deposits, overlying the older gold-bearing gravel, present one of the great difficulties of placer mining in Interior Alaska. The silt itself is practically barren of gold, and in order to reach the underlying placers this overburden must either be removed, or else underground mining methods must be utilized....

"The Recent alluvial deposits are composed mainly of gravel, sand, and silt. Much of the coarser debris has been eroded from bedrock sources and laid down by the present streams. The silt has been derived in considerable measure from the reworking of the older silt, although a certain proportion has also been deposited by recent streams. Certain solifluxional processes peculiar to sub-Arctic regions have also tended to produce fine sediments of this type....

"Stream detritus originates largely by mechanical and chemical weathering of the regional bedrock, but in Interior Alaska the relative importance of these methods is modified by local conditions. Chief among these are the low mean annual temperature and the vegetation. The

mean annual temperature of the Yukon-Tanana region is about 9° below freezing, which alone is capable of producing a condition of permanent frost in the subsurface. In addition to this, the valley floor and sides and also the ridge tops up to an elevation of 3,000 feet are covered with a mantle of mosses and other vegetation, which act as an insulator and tend to prevent the summer heat from penetrating far into the frozen ground below. And these two conditions combine to produce a curious disposition of the local precipitation, for the frozen condition of the deeper ground prevents deep circulation of water, and the mosses prevent a rapid surface runoff of the rainwater. Therefore, the moisture is conserved in a spongelike mossy mat close to the surface, where it favors the growth of vegetation much denser than might be expected in a region where the annual precipitation is only 11 or 12 inches.

"The customary distinction between the water table and the zone of weathering above the water table is in this region hardly valid, for much of the subsurface water, where present, is frozen. Hence the solvent and depositional effects of circulating ground water are almost lacking, and the chemical effects of oxygen and carbon dioxide are sharply restricted, because these reagents are not carried in solution. Chemical weathering, therefore, is much less important as an agent of weathering than in regions farther south.

"The surface of the ground in summer, however, is in a state of alternate thawing and freezing that produces marked mechanical weathering, due to the effects of frost heaving and related processes. The bedrock is loosened and fractured by the freezing and thawing of water, and an angular rubble that shows little oxidation is produced. This rubble tends to accumulate on the ridges as residual material. But the same thrusting forces that fracture and comminute the bedrock are also effective as a means of transportation, for the rock debris is thrust upward and laterally away from its place of origin and begins to move slowly down the hill slopes into the valleys below. Such moving sheets of alluvial material often develop characteristic flow lines along the sides of the valleys so that they resemble successive waves on a shallow body of water...

"Although chemical weathering in the headwater regions of the streams is sharply restricted, and mechanical weathering is seasonal, nevertheless the total amount of debris that is moved by the processes above outlined is remarkably great. It is not uncommon to observe sheets of such alluvial material impinging from both sides of a valley upon a headwater stream at a rate faster than the stream can transport the material downstream, so that the stream tends to flow in a narrow channel, sometimes several feet deep and only a foot or two wide; and in places the lateral debris has actually coalesced over the running water. This residual and semiresidual material is unsorted and includes rock fragments of all sizes, embedded in fine silt. Where the alluvial sheet has moved laterally a considerable distance from its place of origin to a drainage channel, the angular debris becomes rounded to a considerable degree. As soon as this material is exposed to the effects of running water, it begins to move downstream, the silt rather rapidly, especially in times of flood, and the larger rubble more slowly. From this stage onward, however, the erosional processes are essentially similar to those that prevail in more southern latitudes, and the results are essentially the same. The headwater gradients are normally steeper than the gradients of the lower valleys, and at some point or rather some zone in the valley stream action changes from transportation to deposition. As the regional relief is reduced and

the headwater gradients are diminished, this zone of deposition moves upstream, thus developing progressively upstream a fluviatile gravel sheet. As the upper part of the gravel sheet is extended upstream, finer sediments cover the lower part, with the final result that the coarser and heavier sediments form the base of the alluvial section. The uniformity of this process is interrupted by floods, which carry coarse material farther downstream than it would ordinarily go and deposit it on top of finer material, thus resulting here and there in alternating beds of fine and coarse material. This general process of stream alluviation is also modified by local conditions....

"Another condition that modifies the character of the Recent alluvial deposits is the effect of winter ice.... In some of the smaller streams the ice increases greatly during the winter, both in thickness and in area, as a result of overflows of water, acting under hydrostatic pressure from upstream. Such bodies of ice do not move downstream in the spring with the normal winter ice but are dissected by the streams and often remain as valley ice, or "aufeis", nearly all summer. Such deposits of aufeis also have the effect of widening valley floors, for in spring, when the water first begins to flow, channels may be cut along the sides of the ice, thus diverting the stream against the valley walls and producing lateral erosion. Many stretches of wide flat valley floor on the tributaries of the Yukon have been produced in this manner, and it is quite possible that the same process, acting on a larger scale during the glacial epoch, may have been a powerful accessory factor in the development of the Yukon Flats."

3.2 Mineral Resources

The USGS has recently investigated the mineral resources of a major portion of the WMNRA (USGS 1987a), while the State of Alaska has carried out similar work in the remainder, as well as in an adjacent portion of the Steese National Conservation Area (SNCA) immediately to the east (ADGGS 1987). A synopsis extracted, with minor modifications, from the former (USGS 1987a) report follows:

The potential mineral resources for a major portion of the WMNRA have been assessed using the concept of geologic deposit models. A deposit model is defined as the set of attributes common to a particular class of mineral deposit. Most of the deposit models considered can be found in USGS Bulletin 1693 (Cox and Singer 1986). The deposit models were used to identify areas within the WMNRA that exhibited features common to a particular model. The identification of each area was based on detailed geologic mapping, interpretation of geophysical and geochemical data, and examination of the known mineral occurrences. For each identified area, subjective estimates of the number of undiscovered deposits were combined with grade-tonnage data for the respective model to produce estimates of the contained metal content. The assessment methodology used is described by Drew and others (1986) and is embodied in a computer program known informally as MARK3.

Estimates of Major Deposit Types

Subjective probabilistic estimates of the existence and the number of undiscovered deposits have been combined with grade- tonnage models for eight major deposit types (indicated to be present or possibly present) to produce estimates of the contained content for eight different metals and one non-metallic mineral within the part of the WMNRA assessed (USGS 1987a). Within this area, it is estimated that there is an expected 46,000 oz. gold, 4,200,000 oz. silver, 310,000 tons zinc, 180,000 tons lead, 500 tons tin, 2,100 tons tungsten, 7,000 tons thorium, and 6,000 tons rare earth oxides in undiscovered deposits. Overall, it is estimated that there is an expected 6,900,000 tons of undiscovered metallic ore-bearing material. For non-metallics, it is estimated that there are 27 billion tons of exceptionally pure high-calcium limestone. At the present time, significant undiscovered resources of chromium, asbestos, nickel, or diamonds are not predicted. A recent report of the occurrence of platinum in gold samples in the nearby Tolovana mining district makes platinum worthy of further consideration as a potential metallic resource.

A summary of the probabilistic estimates of the existence and the number of undiscovered deposits within the WMNRA for the deposit types considered was given by the USGS (1987a). For most of the deposit types, the probability that one or more undiscovered deposits exist is low. Largely, this is due to the overall lack of evidence of mineralization in the rocks that are exposed at the surface and the degree of weathering that has occurred. It is reasonable to assume that estimates of the existence and of the number of undiscovered deposits might be different if more were known about the subsurface.

Early hydraulic mining operation. From the Wilson F. Erskine collection, courtesy of the Alaska and Polar Regions Department Archives, University of Alaska, Fairbanks.

The ADGGS (1987) study indicates, additionally, the potential for mineral deposits featuring tin, silver, tantalum, tungsten, uranium, rare-earth elements, and gold in bedrock environments in the Lime Peak - Mt. Prindle area.

Placer Deposits

Mertie (1937) presents a useful general discussion of the modes of origin and types of placer deposits found within the Yukon- Tanana Upland. Placer gold has been recovered from the upper tributaries of Beaver Creek since the turn of the century. Placer gold deposits have been located in Bear, Champion, Nome, Trail, and Ophir Creeks. Nome Creek and its major tributary, Ophir Creek, are similar to neighboring creeks in the Fairbanks mining district. The gold in Nome Creek most likely had a common source with the gold in Sourdough Creek, since both drain the same geologic terrane - a small granitic pluton intrusive into metamorphic rocks. Both stream and bench placer gold deposits occur in the area. In addition to gold, other noteworthy minerals which have been recognized in the placers include cassiterite, topaz, monazite, and tourmaline. In terms of known value and production levels, gold is the most important mineral resource in the area of Nome Creek. The cumulative production of placer gold to date from Nome Creek and its tributaries within the WMNRA is estimated to be 29,000 oz. For Nome Creek and its tributaries, it is estimated that there is an additional 6,500 oz. of gold yet to be recovered, and beyond that, it is estimated that there is an expected undiscovered 4,700 oz. and possibly as much as 21,000 oz. of gold within the part of the WMNRA that was assessed (USGS 1987a). The Bureau of Mines has also recently published studies of placer occurrences in the White Mountains NRA (Fechner and Balen 1988). The abstract from this report states:

> "In 1986-87, the Bureau of Mines conducted a literature search and a reconnaissance and site specific placer sampling program of drainages in the White Mountains Study Area. This work was performed as part of a mineral resource assessment study conducted jointly by the Bureau, the Alaska Division of Geological and Geophysical Surveys, and U.S. Geological Survey. The literature search identified fifteen placer mineral properties which were subsequently evaluated during this study. Two hundred sixty-five samples were taken from the drainages in the area during the sampling program. Physically separable quantities of gold were found in 49 samples collected from Beaver, Roy, Mascot, Nome, O'Brien, and Ophir Creeks, and a tributary of American Creek. The majority of these samples and the highest gold values were taken from Nome Creek and the upper portions of Beaver Creek. Nome and Beaver Creeks were consequently rated as having high mineral development potentials for small size (100 to 500 yd^3/day) placer mining operations. The other drainages in the area have low placer mineral development potentials. Placer sample concentrates with anomalous geochemical values have also been identified."

Bedrock

The bedrock underlying the Lime Peak - Mt. Prindle area (ADGGS 1987) consists of a metamorphosed stratigraphic sequence of Proterozoic(?) to Ordovician age that was subsequently intruded by an alkalic igneous suite about 85 to 90 million years ago, and by the Hope granitic suite 57 to 66 million years ago. The regionally metamorphosed and folded bedrock units in the project area

have been intruded by three large, multiphase, biotite granite bodies, which are informally known as the Hope granitic suite, and include the Lime Peak, Quartz Creek, and Mt. Prindle intrusive bodies. All three plutons have been dated at about 57 to 66 million years by potassium/argon methods, and all are differentiated, composite intrusions. In addition to the large plutons of the Hope granitic suite, five other types of intrusive rock are present in the Lime Peak - Mt. Prindle area. They include: 1) an 85 to 90 million year old alkalic suite of hornblende quartz monzonite, lamprophyre, and syenite, 2) the Pinnell Trail monzogranite, 3) felsite dikes and stocks that appear to be associated with the alkalic suite, 4) sills and dikes of gabbro and minor amounts of ultramafic rock in the northwest part of the area, and 5) gabbro dikes that intrude the Hope suite granitic rock.

Surficial Deposits

Surficial deposits produced mainly from mass-wasting processes mantle much of the bedrock in the Lime Peak - Mt. Prindle area. Glacial, glacio-fluvial, and fluvial processes have also contributed to local surficial deposits. Bedrock-rubble colluvium and solifluction lobes include reworked drift in cirque valleys, and are present on high, steep slopes. Drift with morainal form is present in the highest elevation cirque valleys. Low-slope colluvium and alluvial-fan deposits are present on lower slopes and along the flanks of larger stream valleys. Alluvium and outwash are present in small terraces and along active stream channels.

Early Interior placer mining operation. Photo courtesy of Anchorage Museum of History and Art.

Lode Deposits

Mineral assessment investigations (ADGGS 1987) in the Lime Peak - Mt. Prindle area have documented a high favorability for lode mineral deposits. Lode mineral deposits that are present or are likely to be present fall into two categories: those which are related to plutonic rocks and those which are stratabound.

Plutonic-related deposits are associated with:

1) The Hope granite suite, which forms three large plutons in the study area and is very similar to productive tin granites elsewhere in the world. The three plutons have associated mineral occurrences and alteration zones that contain local tin concentrations of 0.1% to almost 2%. The Lime Peak intrusive system includes six prospect areas, and is the most favorable of the three Hope suite plutons for potential economic deposits of tin, with associated silver, tantalum, and tungsten.

2) Small syenite bodies near the western edge of the study area are similar to nearby syenites in the Livengood Quadrangle that host uranium and rare earth-bearing veins.

3) Unexposed intrusive rocks similar to the Pinnell Trail monzogranite are thought to be associated with numerous small tungsten/gold skarns in the Table Mountain area.

4) Moderately alkalic felsite dikes and stocks in the Hope Creek - Table Mountain area appear to be genetically linked to gold enrichment in adjacent sulfide-bearing hornfels (up to 0.5 ppm) and in sulfide-tourmaline-quartz veins (up to 120 ppm).

Stratabound lode mineral potential is confined to the Cleary sequence (?), a volcanogenic unit that has a recognized spatial correlation with gold placer deposits in the study area.

Probabilistic estimates were made (ADGGS 1987) for lode mineral resource potential in the Lime Peak - Mt. Prindle area by comparing various attributes of the observed geology, geochemistry, and mineralization with similar, well-studied mining districts worldwide. This methodology gives a range of potential resources at various levels of certainty. The results indicate that three-quarters of the potential mineral resource is in tin-silver deposits, and about one-quarter is in gold deposits. The quantitative estimates suggest a fair probability (50%) that the Lime Peak - Mt. Prindle area contains as much tin and silver as moderate-sized producing tin districts worldwide (320,000 tons of tin, and about 10 million ounces of silver - a gross metal value of $3 billion at current commodity prices). A small probability (5%) exists that the study area contains three times that amount of tin and silver. Approximately two-thirds of the tin-silver endowment is associated with six prospect areas in the Lime Peak pluton; the remainder of the endowment is distributed through other parts of the Lime Peak pluton, the Quartz Creek pluton, and the Mt. Prindle pluton.

The bulk of uranium and rare-earth potential is confined to the syenite intrusives at the western edge of the Lime Peak-Mt. Prindle area. At a 50% probability, the syenites would contain at least 250 tons of uranium and 520 tons of rare-earth elements (approximately $40 million current gross metal value).

Lode gold is mostly restricted to a belt along the southern part of the Lime Peak-Mt. Prindle study area, and is present primarily in quartz-tourmaline vein-associated occurrences and alkalic- igneous rock-related deposits, with a small contribution from stratabound deposits and skarns. Most of the endowment potential is in large volume, low-grade, disseminated and vein-aggregate deposits. Gold content of the favorable areas at the 50% probability level is equivalent to a large Alaska gold district (1.5 million ounces, $675 million current gross metal value). A low probability (5%) exists that the area could contain ten times as much gold.

Summary Assessment

The foregoing data and interpretations collectively indicate that the Beaver Creek watershed includes some areas of moderate to high potential for accumulation of mineral resources, at a level of certainty based on abundant direct and indirect evidence supporting the possible existence of mineral resources. This evaluation rests on criteria used by the BLM nationwide in its continuing program of energy and mineral resource assessment. Appendix C-2 gives specifics of this classification system.

3.2.1 Mining in the Study Area

Gold has been a major concern during the recent history of the Beaver Creek area, but mining activity has taken place there since 1873. This mining has principally involved placer gold deposits. In 1980, ANILCA designated Beaver Creek as a National Wild River, and the upper watershed as a National Recreation Area.

Any mining activity within this portion of the Beaver Creek watershed would be conducted on federal claims regulated by the BLM. There are no State lands or patented mining claims in the White Mountains National Recreation Area.

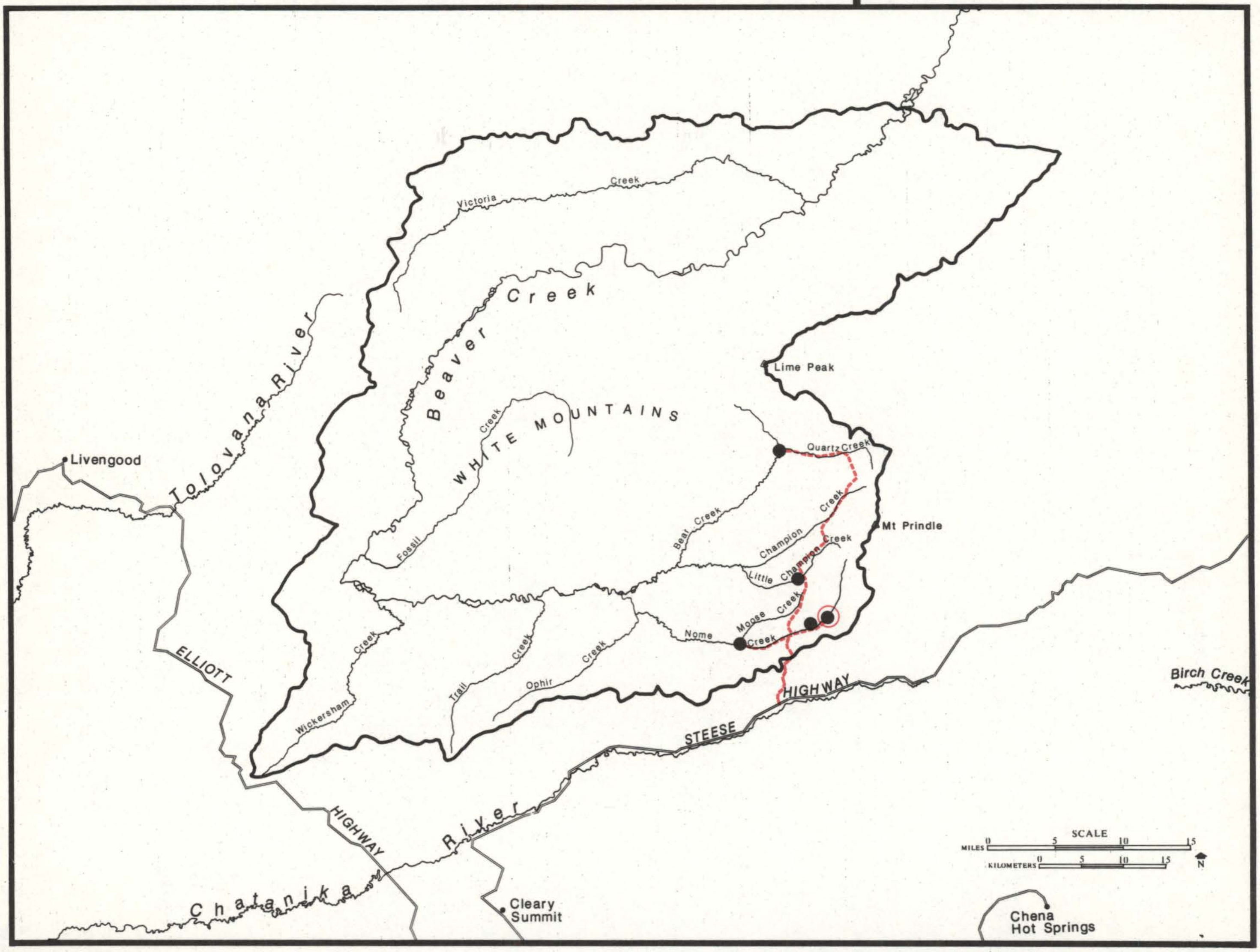
Water Quality

Water quality standards in some form have been in effect for placer mining for over ten years. EPA began issuing National Pollutant Discharge Elimination System (NPDES) permits in 1976 and has changed the permit requirements several times since then (Hagler, Bailly and Company 1987). Permits have required varying mine effluent limitations for settleable solids and turbidity, and over the years requirements have become more stringent.

Nevertheless, Alaska's placer mining industry was growing in the late 1970's due to increases in the price of gold. Although water quality standards were in effect, active enforcement of mining water discharge standards was nonexistent or minimal at best, and many miners operated without employing wastewater treatment techniques. By the early 1980's, it became obvious to the State of

Beaver Creek FINAL Cumulative Environmental Impact Statement

Placer Mining Operations and Access Roads



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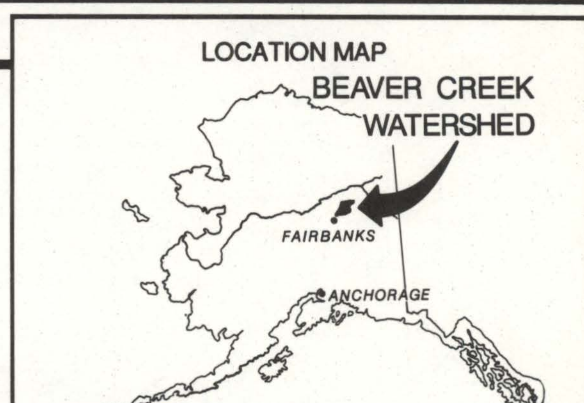
Working 1987 Federal operations *

Planned 1987 Federal operations *

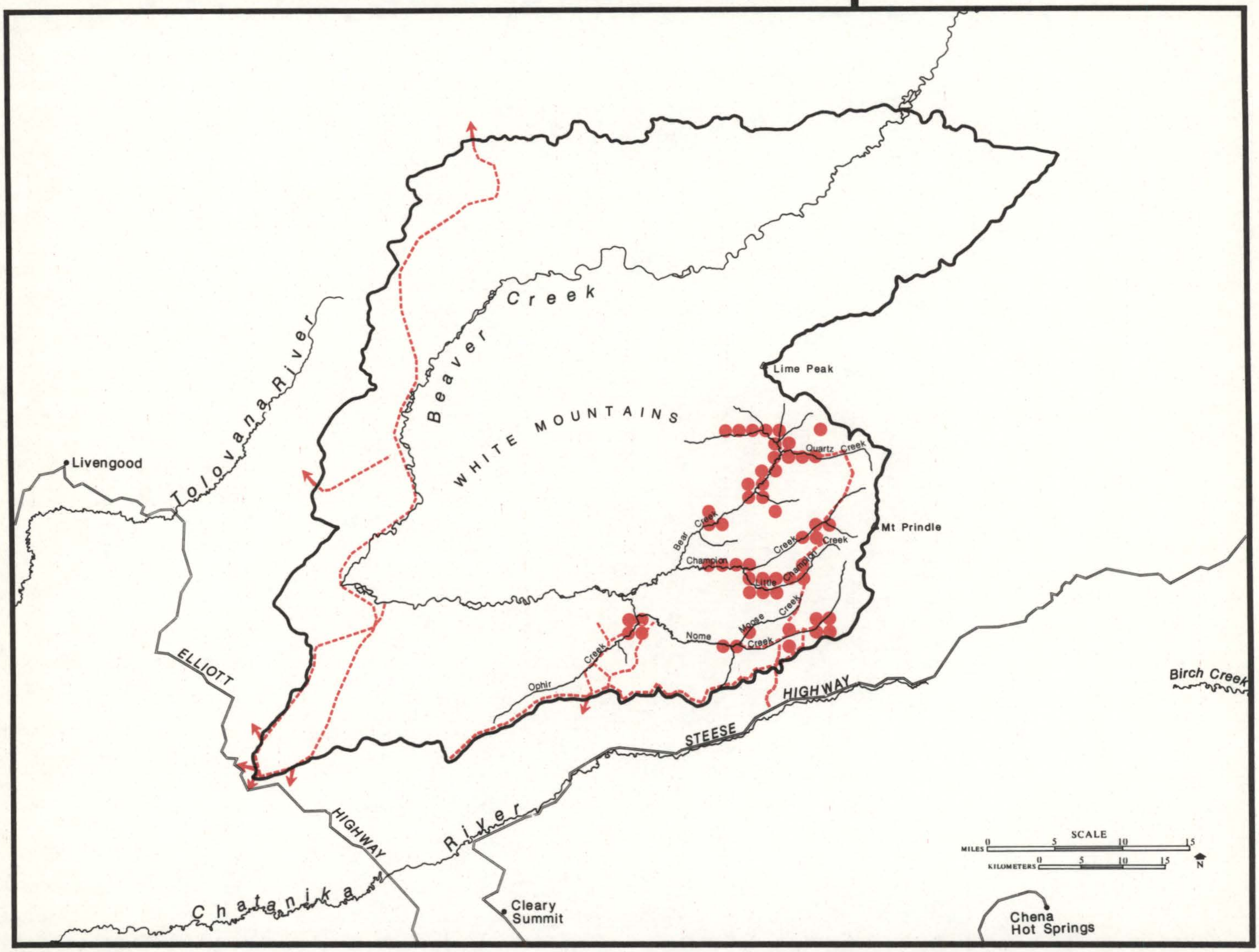
Roads and Trails



There are approximately 131 active Federal mining claims located in the Beaver Creek watershed according to BLM records. The operations depicted above include only those active claims for which Annual Placer Mining Applications were filed for the 1987 field season. Refer to the Recreation map for sites where all claims are located.

Beaver Creek
FINAL
Cumulative Environmental Impact Statement

Placer Claims



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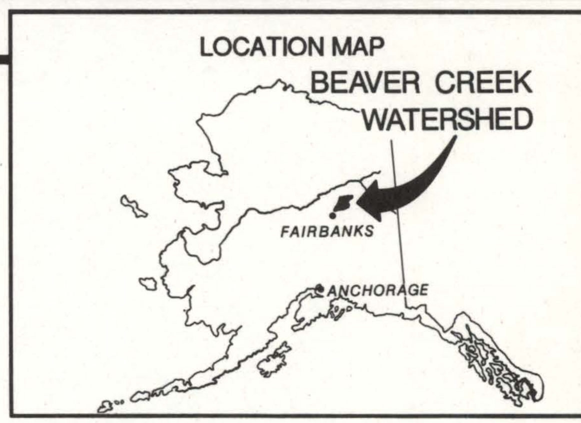
Active placer claim(s)*

Roads and Trails



* Mining claims shown as active on BLM records, but not actually operating in 1987. One dot may represent more than one claim.

Alaska that water quality of mined streams was suffering and that the then current mining practices were not adequate to meet the water quality standards. To evaluate and attempt to resolve the problem, the Alaska Department of Environmental Conservation (ADEC) and other State agencies initiated numerous studies of placer mining's potential effects on the aquatic environment. They also sponsored projects to develop and field test wastewater treatment techniques. Active enforcement was also undertaken by federal agencies.

Settling Ponds and Settleable Solids

One of the first field projects, a 1981 study on settling ponds, revealed that "the effluent from placer mines typically does not meet all State and federal water quality standards. The standards for turbidity and arsenic were almost never met and the standard for settleable solids was met with various degrees of success. The pH and temperature standards were met most of the time, and the standard for dissolved oxygen was met all the time" (ADEC 1982). Seven of the nine project mines with settling ponds met the settleable solids standards.

Follow-up studies and projects have shown that properly designed and operated settling ponds can effectively remove settleable solids, allowing compliance with the settleable solid standard. These studies have also shown that arsenic and mercury are effectively reduced to non-hazardous levels with simple settling of mine effluent (EPA 1987b). Knowing the value of effective settling ponds, miners began constructing and using ponds to treat their mine discharge water, and by 1987 most mines met the settleable solid limitation of 0.2 ml/l (EPA 1987b; Hagler, Bailly and Company 1987; and observations of BLM mine inspectors, DOI 1986c and 1987b).

Turbidity and Other Treatment Methods

Meeting the effluent turbidity limitations has proven to be more difficult than meeting the settleable solids standard. Simple settling is not effective to meet the turbidity requirement (EPA 1987b), so other techniques have been tried to reduce turbidity to acceptable levels. These techniques included classification, clean water bypass, recycling mine water, tailing filtration, and coagulation/flocculation. The first four techniques worked well to reduce water used in the mining process or the amount of effluent discharged and helped to improve the overall water quality of the receiving stream. Although these treatment techniques helped to improve water quality, the effluent discharge still was not in compliance with the standards.

Coagulation/Flocculation

The last treatment listed, coagulation/flocculation, involves mixing chemicals with mine process water. The chemicals react with sediment particles suspended in the process water, causing them to fall out of suspension. This treatment must be tailored to each mining operation and requires technical expertise to select and design an application system (ADEC 1987a). Unfortunately, systems have not consistently produced mine effluent that meets the water quality standards, and the long-term cost of such a system is somewhat uncertain (ADEC 1987a). Given these circumstances, few mine operators are willing to invest time and money into a system that cannot ensure compliance, especially if their current operation is not cited for noncompliance of turbidity standards. The State and EPA have not rigorously enforced this standard at most mine locations (Hagler, Bailly

and Company 1987). However, "the State routinely works with miners, presents workshops, etc. on classification, clean water bypass, tailings filtration, etc. to help achieve the turbidity standard" (State of Alaska 1988).

Corps Permits

Beginning in 1988, the Corps requires miners to obtain a permit for operations that discharge dredge or fill materials into waters and wetlands and/or that obstruct or alter these waters. This requirement is not new, but few miners have obtained these permits in the past. Reclamation standards may be similar to those currently required of federal operators. Meeting reclamation standards to comply with various requirements may increase costs for some mine operations.

3.2.2 Active Mines

The entire study area is within the White Mountains National Recreation Area, and as a result of court actions all operators will be required to file a Plan of Operations on all activities previously filed as Notices. A Plan of Operations, submitted for any mining activity causing more than casual use disturbance, requires that an Environmental Assessment be prepared by BLM before mining activities begin. Five mining operations (Placer Mining Operations Map, Chapter Three) were proposed in 1987 (ADNR 1987); however, only one mine operated. It was on Nome Creek and mined approximately one acre, with a total disturbance of three acres. There are 131 valid existing placer claims in the Beaver Creek watershed:

- Bear Creek - 26 claims
- Quartz Creek - 13 claims
- Champion Creek - 31 claims
- Little Champion Creek - 30 claims
- Moose Creek - 3 claims
- Ophir Creek - 12 claims
- Nome Creek - 16 claims

The general locations of these claims are shown on the Placer Claims Map (Chapter Three).

The 1987 Operating Mine

To protect the clear-running Nome and Beaver Creeks, the mine was operated with no effluent discharge. The area to be mined was located in old mine tailings, so topsoil was non-existent and overburden removal to reach gold-bearing gravels was minimal. Site preparation consisted of hauling a small trailer to the camp, preparing a work pad for the washplant, and constructing two small settling ponds. The first pond was for settling sediments and providing water for recirculation. The second pond collected seepage or overflow from the first pond. The mine operated, as approved in the Plan of Operations, for three weeks in September and October. It had no direct discharge into Nome Creek, but the settling ponds had seepage that clouded a portion of the creek for several miles (Nome creek is split into two channels at this location). This turbid flow had sufficiently diluted and filtered through old dredge tailings to reduce Nome Creek's turbidity level to nearly undetec-

table levels by the time it reached Beaver Creek. After mining was completed, the mine cut and tailing piles were leveled and reshaped, the settling ponds were shut off from further water inflow and covered with tailings, and the overburden was spread over the reconfigured site.

3.3 Soils

There are three broad soil associations within the Beaver Creek watershed (DOA 1979). These associations are only general descriptions of the specific soil types that may occur and have only been identified through interpretation of vegetation patterns from aerial photography. There may be considerable variation in the specific soil properties within each association. All of the soils in the area are cryogenic; that is, soils formed under cold conditions which show cold soil temperatures. Due to seasonally cold temperatures, the entire Yukon - Tanana region is underlain by discontinuous, moderately thick to thin permafrost. Pewe (1982) describes permafrost as:

> "...naturally occurring material with a temperature colder than 32° F for at least two years. Permafrost is defined exclusively on the basis of temperature.... Most permafrost is cemented by ice, but permafrost without water, and thus without ice, is termed dry permafrost. The upper surface of permafrost is known as the permafrost table. In permafrost areas, the layer of ground that freezes each winter and thaws each summer, called the active layer, -- varies in thickness according to its moisture content. Generally, this thickness is from one-half to one foot in wet, organic sediments and up to six to nine feet in well-drained gravels.... When the mean annual air temperature drops below 32° F, ground frozen during the winter may not completely thaw in the summer, and a layer of permafrost may form. This layer may continue to thicken below the seasonally frozen ground. The thickness of the permafrost layer is controlled by the balance between the mean annual air temperature and the geothermal gradient.... In the northern hemisphere, perennially frozen ground is differentiated into two broad zones of lateral continuity: the continuous permafrost zone and the discontinuous permafrost zone. In the continuous zone, permafrost is present everywhere except under lakes and rivers that do not freeze to the bottom. The discontinuous zone includes numerous permafrost- free areas that progressively increase in size and number from north to south."

The three general soil associations in the Beaver Creek watershed are:

3.3.1 The Typic Cryochrepts Soil Association

This association occurs extensively in the uplands of Interior Alaska and constitutes the major soil association in the Beaver Creek drainage. It occurs on high rounded ridges and hills, and valley side slopes typical of the Tanana hills region. Elevations can range from 1,000 to 3,500 feet and can occasionally exceed 4,500 feet. These soils have developed from a variety of parent materials. On the hills they have formed from material weathered from the local bedrock. In the valleys they have formed from deep loamy sediment washed from the surrounding uplands. These soils are almost universally underlain by permafrost.

The vegetation patterns for this association are dictated mainly by the patterns of permafrost. On the south-facing slopes where the permafrost table is deep or occasionally absent and the soils are well-drained, the vegetation consists mainly of white spruce, aspen, and paper birch. At the higher elevations the soils are covered by alpine shrubs, sedges, lichens, mosses, and forbs. On north-facing slopes where the permafrost is continuous and shallow, the vegetation is mainly black spruce with an understory of mosses, tussocks, and low shrubs.

The soils in this association are generally not suitable for cultivation and present severe construction or engineering restrictions. There are only limited areas suitable for commercial forestry or cultivation of vegetable crops. Those areas are located in the bottom of broad valleys where slopes, if disturbed, remain stable. Disturbance of the insulating vegetative mat on these soils can result in severe erosion. When this mat is disturbed or removed, the underlying permafrost begins to thaw and the loamy texture of the soil is susceptible to rapid erosion. On sideslopes this erosion can appear as gullying, mudslides, slope failures, and other forms of mass movement. In level areas the thawing can produce thermokarsts, which are areas of local subsidence resulting from the thawing of underground ice. Thermokarsts can become quite large and may eventually become lakes or ponds.

3.3.2 The Pergelic Cryaquepts-Pergelic Cryochrepts Soil Association

This association occurs on steep unglaciated hills and mountains in the Interior highlands. Most of these soil types have developed above treeline from very gravelly or flaggy colluvial material weathered from the local bedrock. Elevations range from 1,000 to 5,000 feet, with some mountain peaks over 5,000 feet. The soils in this association are predominantly poorly drained, and ice-rich permafrost occurs on north facing slopes.

Soils at the higher elevations and in well-drained areas at lower elevations are covered by a layer of sparse, shrubby vegetation. The highest elevations can develop patterned ground features such as solifluction lobes, stone stripes, and frost boils. At the lowest elevations and in natural waterways, the vegetation consists of a mixed white spruce/birch/aspen forest. Soils which are dominated by permafrost at shallow depths, such as on the north-facing slopes, support black spruce and sedge tussocks.

Soils in this association are too cold and steep for cultivation and support only very limited harvesting of commercial timber. These soils present severe restrictions for road location, building sites, or off-road traffic.

3.3.3 The Lithic Cryorthents Soil Association

This association occurs in the high mountainous regions of the area. Characteristically, the topography is very rough with deeply dissected valleys and sharp rocky ridges. Soils at the higher elevations are too shallow for ice-rich permafrost to develop, but it can occur at the lower elevations. In this area these soils occur at elevations of at least 5,000 feet.

The highest areas are barren of vegetation or support a sparse cover of alpine tundra. The lower elevations and the valley bottoms support a shrubby vegetation, with black spruce forest at the lowest elevations. These soils are too steep and cold, and occur at elevations too high to support any cultivation or forestry. The steep slopes and occasional permafrost severely restrict construction or engineering within these soils.

3.4 Water Resources

3.4.1 Interrelationships and Overview

Water enters the watershed in three primary ways: as precipitation, intercepted atmospheric moisture, and condensation. Some of this water adheres to the leaves and branches of vegetation and is either adsorbed, drips to the vegetated floor, or evaporates.

Precipitation reaching the vegetated floor contributes first to surface storage on the vegetated litter, or it is ponded in depressions, or held in the snowpack. It then infiltrates the soil or runs off as overland flow. Water infiltrates, flows laterally, and eventually surfaces as streamflow.

Infiltrated water is detained temporarily by the soil as it percolates toward groundwater or streams, but a portion is retained, eventually to be evaporated or transpired. The amount of water retained and available for use by vegetation depends on soil density, structure, depth, organic matter particle size and content. Evapotransportation is related to the regional climate and to the microclimate as controlled by local slope, aspect, elevation, and vegetation.

Yield is defined as water not evaporated, transpired, or retained by the soil. It includes both surface runoff as the streamflow, and subsurface groundwater. Streamflow is the product of input (precipitation) minus loss (evapotranspiration, contribution to groundwater aquifers, and the capacity of the soil to store water).

While it is generally apparent that water exerts a major control over vegetation, vegetation has some control over water. Natural or human-caused modification of the vegetative cover can potentially affect all segments of the hydrologic cycle, for example:

1) The distribution of water and snow on the ground.

2) The amount of water intercepted or evaporated by foliage.

3) The amount of water that can be stored in the soil or transpired from the soil by vegetation.

4) The physical structure of soil which governs the rate and pathways of water movement to stream channels.

These changes can also have a major effect on streamflow. Streamflow characteristics such as annual yields and peak flows can be altered by human activities such as placer mining, and by natural events such as wildfire.

Atmospheric moisture contains dissolved gases and chemical ions, including some caused by human activities. Generally, precipitation has a low dissolved ions content, and streamflow quality is largely determined by other factors. Water quality variables of concern include stream temperature, dissolved substances, and suspended sediment.

Stream temperature is controlled by exposure to direct solar radiation and the temperature of inflowing tributary or ground water. Stream temperature may be affected by practices which remove shade from streamside areas or alter channel morphology.

Aspects of concern regarding the chemical composition of stream water include acidity, inorganic cations and anions, and organic substances. The chemical constituents and acidity are controlled principally by mineral weathering in the parent materials and soils.

Water yield and quality is the final product of the hydrologic cycle and reflects water-soil-vegetation interactions. Of concern are such runoff characteristics as the amount and temporal variations, and quality as indexed by temperature, dissolved constituents, suspended sediments, and bedload.

> "Sediment transport is very complex. At least 30 variables are locked into the sedimentation processes, and the degree of interdependency between these variables is not fully understood. It is not surprising, therefore, that a reliable numerical method for determining bedload transport in alluvial streams is not yet available. Available methods are based on empirical relationships between a selected number of variables or require prerequisites based on assumptions not necessarily valid for the comparisons." (Heede 1980)

The sediment load of a stream (both suspended and bedload) is determined by such characteristics of the drainage basin as geology, soils, vegetation, precipitation, topography, and land use. Sediments enter the stream system by a variety of erosional processes. To achieve stream stability, an equilibrium must be sustained between sediment entering the stream and sediment transported through the channel. Human activities such as mining as well as natural events which change sediment loading can upset this balance and result in physical and biological changes in the stream system. Sediment from mine effluent is limited to particles smaller than 0.02 millimeters (mm) if the mine has settling ponds which meet the settleable solids standards. Larger settling ponds may remove particles as small as 0.002 mm. Thus clay and silt size particles contributed to the alluvial environment become a part of the suspended load of the stream and are readily transported by this environment (State of Alaska 1988).

Turbidity and Suspended Sediment

The following discussion addresses the relationship between turbidity and suspended sediment and is essentially an extraction from ADEC (1985). Analysis of suspended solids concentrations is conducted as a gravimetric determination of the particulate matter in a given volume of water. The

results are usually expressed as milligrams per liter (mg/l). Turbidity, on the other hand, is a measure of the optical properties of the water column, and the way that light is deflected or absorbed by particulates. This is affected by such characteristics as size and size distribution, shape, refractive index, and absorption spectral properties of the suspended sediments. While "suspended sediment" measures particle mass, turbidity measurements are more a determination of the effect of suspended sediments on light transmission, and therefore, the impact to the biological community. There is no direct quantitative relationship between these parameters, they merely are both methods of measuring particulates. In part, due to the cost and effort required to conduct the required laboratory analysis for the latter, turbidity has been used as an indirect measure of suspended sediments.

3.4.2 Basin Characteristics

Beaver Creek is a non-glacial, Interior stream which originates in the White Mountains approximately 50 miles northeast of Fairbanks, Alaska. The drainage lies within the Interior climatic zone. Average annual precipitation is 15-20 inches, with three to four inches of water equivalent occurring as snow (15-20 inch snow pack). Large storm patterns generally originate from the west to northwest. Localized thundershowers are characteristic during the summer months. Basin soils are characterized by a high permafrost content and a shallow active layer.

Beaver Creek originates at the confluence of Champion and Bear Creeks and flows generally in a northerly direction. (See Tributaries and Main Physical Features Map in Chapter One) For the first 111 miles it passes through the White Mountains National Recreation Area at a gradient of approximately eight feet per mile. Just below the confluence with Victoria Creek the gradient decreases to two feet per mile as the stream meanders through the Yukon Flats for the remaining 170 miles to its mouth at the Yukon River.

The linear configuration of Beaver Creek, the shallow active soil layer, and the lack of surface storage indicate a stream which responds rapidly to precipitation and maintains minimal flows during the dry winter. Peak flows occur during spring break-up, with minor peaks occurring during summer storms. Large storms may generate 2.5 or more inches of rain (Weather Bureau 1963), creating flooding of the lower reaches. Minimum flows are augmented by the presence of the springs at the "Big Bend" of Beaver Creek, a probable result of solution-enhanced effective porosity of the limestone bedrock of the White Mountains. These springs create a significant wintering habitat for grayling and long stretches of open water even during the most severe winters (Webb 1987).

There is no long-term record of water resources available for the basin. Most of the data which have been gathered for Beaver Creek are the result of an instream flow quantification conducted by the BLM during the summer of 1986 (DOI 1987c). From late July to early August 1986, investigations were conducted on Beaver Creek, from its headwaters to a point approximately 85 miles downstream, as part of a water rights assessment for Beaver Creek (DOI 1987c). Included in this assessment are descriptions of hydrology and channel morphology that provide essentially the only available data of this type for the Beaver Creek drainage; although observations have been recorded

by ADF&G and BLM field personnel as well. An analysis of basin characteristics and available data from adjacent drainages were used in the water assessment report to derive a reasonable estimate of streamflow characteristics. The estimated streamflow for Beaver Creek at the headwaters (mile 0.0), just above "Big Bend" (mile 35), and above Victoria Creek (mile 112) are shown in Figure 3-1.

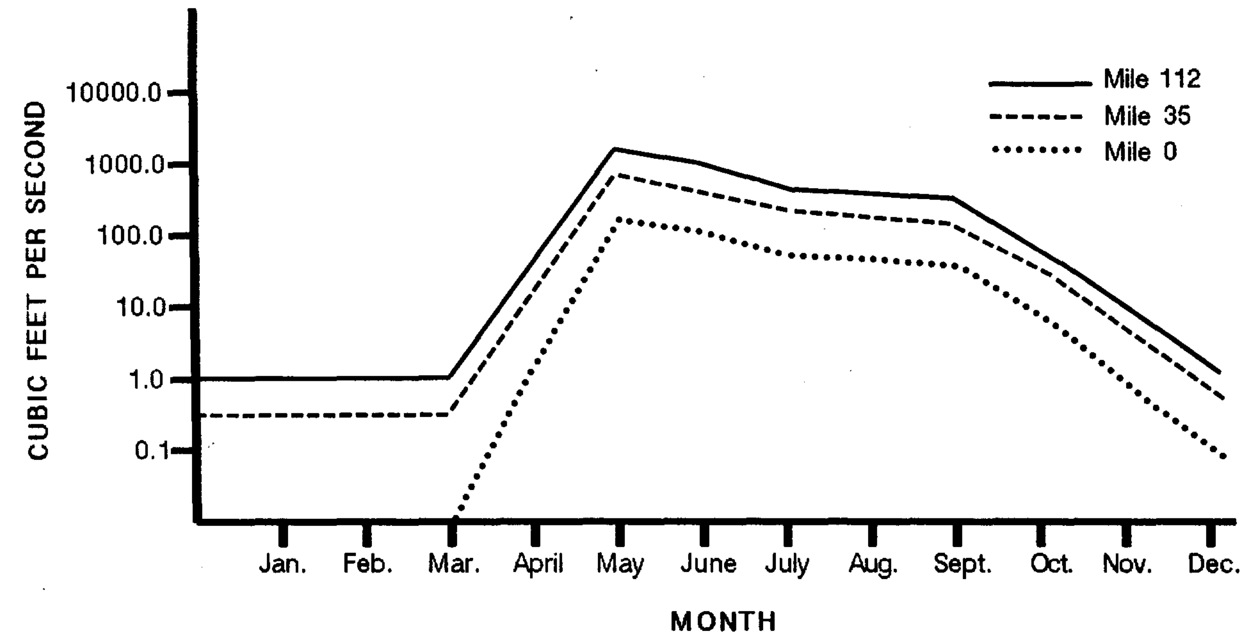


Figure 3-1. Estimated streamflows for Beaver Creek. (DOI 1987c)

In general, Beaver Creek has good water quality and this is borne out by what little information is available. BLM obtained grab water quality samples from 12 locations on Beaver Creek during the water rights assessment in 1986 and analyzed them for specific conductance, acidity, total dissolved solids, total suspended solids, total solids, and percent of volatile solids (Figure 3-2). Analysis suggests that most of the turbidity consisted of organic material at all but the highest flows (DOI 1987c). As stream capacity increases during high flows, the percentage composition of inorganic material increases. Rates of sediment transport are very low even during these periods. Drawing on water quality and quantity data in the Beaver Creek water assessment report (DOI 1987c), and assuming these conditions to be representative of the stream during August, estimates were made of the total amount of material transported. The estimated sediment load at the headwaters (mile 0.0) would be 0.2 tons per day (1.0 mg/l sediment at 71 cfs converted to tons per day). Similarly, the estimated sediment load of the main stream just above Victoria Creek would be approximately 80 tons per day (46 mg/l at 649 cfs). The increase in sedimentation can be attributed to the normal increase in particulate matter loading as stream flow increases. These figures are relatively low, and compare favorably with the information presented by Selkregg (1974) concerning sediment transport by streams throughout the region.

Sample Identification	Specific Conductance umho/cm	pH Units at Deg. C.	Total Dissolved Solids mg/l	Total Suspended Solids mg/l	Total Solids mg/l	Percentage of Volatile Solids
Sample 1 Nome Creek	70	7.1 at 18	71	2.0	90	62%
Sample 2 Beaver Creek #1 WRM 0.0	55	7.0 at 18	47	1.0	84	76%
Sample 3 Victoria Creek High Flow, Aug. 1	120	7.2 at 17.1	131	162.0	378	22%
Sample 4 Beaver Creek WRM 10	62	7.1 at 18.6	101	19.0	114	56%
Sample 5 Beaver Creek WRM 54, July 29	84	7.3 at 18.7	93	1.0	94	57%
Sample 6 Beaver Creek WRM 37.5, July 29	60	6.9 at 18.3	80	7.0	74	81%
Sample 7 Beaver Creek WRM 68.5	85	7.2 at 18.6	71	9.0	120	65%
Sample 8 Beaver Creek WRM 8	71	7.1 at 18.5	53	5.0	80	55%
Sample 9 Beaver Creek Above Victoria, Aug. 2	89	7.1 at 19.3	82	52.0	254	33%
Sample 10 Victoria Creek Aug. 2, at mouth	115	7.2 at 18.6	97	168.0	496	25%
Sample 11 Beaver Creek & WRM 109.5 High Flow, Aug. 1	103	7.1 at 17.4	79	46.0	212	40%
Sample 12 WRM 68.5, July 31 Day after rain	85	6.9 at 17.9	71	21.0	154	49%

Figure 3-2. Beaver Creek water quality data. (DOI 1987c)

An evaluation of the current contribution of disturbed areas to water quality in Beaver Creek hinges on an understanding of the roles of settleable solids and turbidity, two of the current standards used in such evaluations. Settleable solids are those materials in suspension in the water column which drop out as stream flow decreases. The amount of material which settles depends on stream velocity, time, and the characteristics of the particulate matter (relative size, shape, density, etc.). The slower a stream moves, and the longer that it remains in this state, the more material will settle out. Certain types of waste water treatment, such as settling ponds, work on this principle. Research indicates that to reduce the effects of sediments on aquatic environments to acceptable limits certain standards must be achieved. The current effluent standard requires that no more than 0.2 ml/l of sediments drop out of a column of water which remains still for one hour.

There has been some placer mining and road construction activity in the Beaver Creek watershed which has caused deterioration of water quality in the basin. Most of the activity has taken place in the Nome Creek watershed and its small tributaries. Nome Creek itself was dredged from the 1920's to 1940's, presumably with very few or no measures taken for wastewater treatment. Currently, there is no overt evidence of sedimentation in the first 135 miles of the Beaver Creek channel from this historic mining. In the 1970's and 1980's, Nome Creek was mined periodically by small to medium-sized placer operations. These operations have caused noticeable and sometimes dramatic increases in the turbidity of Nome Creek and downstream on Beaver Creek. Webb (1982) reported that muddy water discharges into Beaver Creek from mining activities on Nome Creek were visible as far as 50 miles downstream. These increases in turbidity have not been persistent and do not appear to create long-term alterations in stream attributes. There are no data available to determine aggradation or degradation of the channel due to possible sedimentation from mining activities, but analysis of aerial photography and field observations do not indicate any abnormal changes or adjustments in channel morphology due to sedimentation of Beaver Creek (Vogler pers. ob.). During the 1987 mining season, one mining operation was active in the Nome Creek drainage. This operation was only active during late August through September; a 100% recycling system was used with two ponds, one for recycling and one for overflow. Any excess water was routed out of the second pond into a ditch to be filtered into the ground. The filter system was not entirely effective and there were some noticeable turbidity increases in Nome Creek near the mine. By the time Nome Creek entered Beaver Creek the dilution was sufficient to make any indication of increased turbidity undetectable by the eye.

Observations of impacts from non-point sources, such as the older unreclaimed disturbances, have been documented. ADF&G (1987a) reports that the unstable channel in upper portion of Nome Creek causes periodic sediment discharges. Additionally, fine grained deposits were observed in wooded areas downstream from mining activities on Nome Creek. There are no data available to quantify the degree of impact from these sources. The majority of these impacts probably occur during periods of high flow such as spring breakup and after large storm events.

The following are prominent streams of concern in the headwaters area of the drainage:

Bear Creek

Bear Creek is a clear, rapid stream (average gradient of 0.85%) containing long riffle areas with relatively few pools. The substrate is a non-embedded gravel-cobble mixture (75-200 mm in diameter) particularly in the lower reaches of the stream. The substrate in the upper reaches is predominantly cobble. Bear Creek is seldom deeper than ten feet and in places the stream channel may be up to 115 feet wide, with rocky gravel bars present throughout. Riparian vegetation consists of a willow/white spruce mixture.

Quartz Creek

Quartz Creek is the major tributary entering Bear Creek and has a gradient of 1.4%. It is a clear stream composed almost entirely of riffle areas. The substrate is generally a non-embedded gravel-cobble mixture; however, a braided area approximately two miles upstream of the Quartz-Bear Creek confluence supports a substrate composed of finer materials that tend to accumulate in backwater areas. Quartz Creek ranges in width from up to 55 feet in its braided area to less than 28 feet for the majority of the creek. It is generally less than five feet deep. Riparian vegetation is a spruce/willow mixture, with willow predominating at higher elevations.

Champion Creek

Champion Creek joins Bear Creek to form Beaver Creek. Upper Champion Creek is a clear stream composed almost entirely of riffle areas and has a gradient of 1.6%. The substrate ranges from gravel to large cobble (75-305 mm in diameter) and is not embedded. Upper Champion Creek rarely exceeds 47 feet in width or five feet in depth. Lower Champion Creek has a lower gradient (0.8%) than upper Champion Creek, is larger and deeper, has more meanders, and has a finer substrate, the result of flow from Little Champion Creek and the decrease in gradient from the widening of the valley. Lower Champion Creek has long riffle areas and occasional short pools, may be up to 105 feet wide, and is generally less than ten feet deep. Riparian vegetation along lower Champion Creek consists primarily of willow, white spruce, and blueberry, and is similar to that found in the upper reaches.

Little Champion Creek

Little Champion Creek, a tributary to Champion Creek, has a 1.9% gradient, is composed almost entirely of riffles, averages one to two feet in depth, and is seldom wider than 28 feet. The non- embedded substrate ranges from gravel to small boulders (75-305 mm in diameter), with cobble-sized rocks most common. Riparian vegetation consists primarily of willow and white spruce. Post (1986b) reported that the upper portion of Little Champion Creek contained about a 2.55% gradient, and that the stream was wooded.

Nome Creek

Placer gold deposits were first discovered on upper Nome Creek in 1910, and later mined (along with tin) in the 1920-1940 period by a bucket line dredge (DOI 1983b). Post (1986a) observed in 1986 that the stream channel in upper Nome Creek near the headwaters above the mined area was about 4% gradient and contained few resting places for arctic grayling. The water in the upper portion of the creek was clear in June 1986. Post further observed that the lower portion of the stream contained pools and eddies that could offer holding areas for arctic grayling. Post (1986b) described the upper Nome Creek drainage as follows:

> "The upper portion of Pavey's former operation consists of a large stripped area. The strippings have been pushed to the north side of the valley floor where they form a long vegetated stockpile. Some willow regeneration is apparent in the stripped area, and ground cover is present.... Below the stripped and unmined area...Nome Creek has a poorly defined channel that may be a barrier to fish passage at low summer flows. It is unclear whether this area was mined or just bladed without mining. There are no large tailings piles in this reach, but several old diversion channels are present. The natural stream pattern has been obliterated.... The visual observation...of what appeared to be an arctic grayling (in the old settling) ponds is evidence that fish could benefit from rehabilitation of these features."

3.4.3 Physical Changes to Stream Channel

Effects to the Channel Bed

Approximately nine miles of Nome Creek have been mined (Post 1986a). Nome Creek, in the section disturbed by mining, is characterized by straight, shallow, high velocity, and frequently split stream channels that make their way through dredge and dozer tailings. The stream channel in the uppermost mined section of Nome Creek is quite unstable and is eroding adjacent tailing piles, creating periodic sediment pollution.

Sediment Deposition

No data discussing sediment deposition within the stream channels of Beaver Creek or its tributary streams were located. Refer to Section 3.4.1 for a general discussion of this topic.

Degradation and Cementing of Streambed

No data discussing degradation and cementing of streambeds in the Beaver Creek drainage were located. Refer to Section 3.4.1 for a general discussion of this topic.

Increased Aufeis Formation

Heavy accumulations of aufeis have been observed in disturbed portions of Nome Creek, including the area near the mouth of Moose Creek and the area near the end of U.S. Creek Road (Post, pers. comm. 1987). The extent to which these observed conditions differ from pre-disturbance conditions is unknown.

3.4.4 Changes in Water Quality

Heavy Metals

No data discussing heavy metals for the Beaver Creek drainage were located. Refer to Section 4.4 for a general discussion of this topic.

Non-point Sources of Sediment at Breakup

Post (pers. comm. 1987) observed the confluence of Nome Creek and Beaver Creek from the air on June 9, 1986. Nome Creek was visibly more turbid than Beaver Creek, a difference attributed to extensive mining-related disturbance in the Nome Creek drainage. Aufeis was still present on this date. On the following day, Post and BLM personnel observed that lower Nome Creek was too high and fast to wade in hip boots. Turbidity was sufficiently high to obscure the bottom of the stream.

Post (1986b) observed evidence of active erosion of tailing piles containing fine-grained material from dozer mining in the "Pavey" section of Nome Creek (above Sumner Creek) during periods of high flow. Further evidence for non-point sources of suspended solids in the upper reaches of Nome Creek is the observation by Post (1986b) of cloudy water at the end of the U.S. Creek Road on June 25, 1986, during a period of high flow. A camper reported that the stream had been very high and turbid on the previous day. Post (1986b) found that water clarity was excellent above the mined portion of Nome Creek on the former date.

Hazardous Materials

Most mining operations in Alaska use only a limited variety of materials which are currently categorized as hazardous. In the Beaver Creek drainage these are currently limited to fuels and solvents. We do not anticipate the use of explosives or the chemical processing of gold-bearing ores, the other sources of hazardous materials in placer operations, within the time constraints encompassed by this analysis. Regulations at 40 CFR 112 require that operators of facilities with fuels stored in excess of 660 gallons per single container or 1,320 gallons in aggregate prepare and implement Oil Spill Control and Countermeasures (SPCC) plans. Secondary containment, such as provided by a continuous berm or dike, is required in conjunction with the plan. The purpose of the regulation is to reduce the likelihood of a spill reaching navigable waters and to reduce the extent of damage if such a spill should occur. Operators are required to report spills entering navigable waters or adjoining shorelines to the National Response Center.

State regulations (18 AAC 75) require differing levels of response depending on the amount of hazardous material spilled. However, any spill must be reported. Ultimate disposal of hazardous substances must be approved by the Alaska Department of Environmental Conservation (ADEC); however, no permit is required. While little attention has been given to disposal of solid wastes in the past, the ADEC intends to require compliance with the regulations in the future. The current recommendation for such waste disposal is burning combustibles and back-hauling non- combustibles. Landfills may be permitted on a site-specific basis.

3.5 Landcover

3.5.1 Introduction

The vegetation components of an ecosystem grow in response to the elements in the environment. As discussed previously in the Soil and Water Resources sections, vegetation influences and is affected by the complex interrelationships of biotic and physical factors. The resultant vegetative communities vary in the species present (flora), the percentage of these species (composition), the spatial and vertical arrangement of the plants (structure), and in the productivity of organic material (function).

The vegetative cover of an area is an integrated expression of historic and present conditions and disturbances. Burned areas are visible in the mosaic of vegetation patterns over 100 years after the wildfire. Riparian vegetation on floodplains results from ice-free well-drained soils. Prostrate alpine vegetation has adapted to short growing seasons and exposure to desiccating winds throughout the year. Shallowly rooted black spruce grow on ice-rich permafrost soils. The ground cover of *Sphagnum spp.* moss insulates the soils and contributes to the lowered soil temperatures which result in permafrost. Wetland communities grow in response to a high water table, and serve as a buffer to fluctuations in the water table.

Vegetation is an important component of habitat for wildlife and human populations. Vegetation is used for food and shelter by most species in the watershed. Sometimes, fauna impacts the vegetation sufficiently to change the community on a site. Moose may severely overbrowse the willows of an area, beaver may flood out sedge/shrub meadows, or humans may remove the vegetation entirely for mining activities.

After various disturbances, the vegetation usually grows back on a site. A series of different communities usually replace each other as environmental conditions change. This process is succession. The community composition and rate of change result from the severity and size of the disturbance, the soils and climatic conditions on the sites, the availability of reproductive materials, and conditions for establishment of seeds or vegetative propagules.

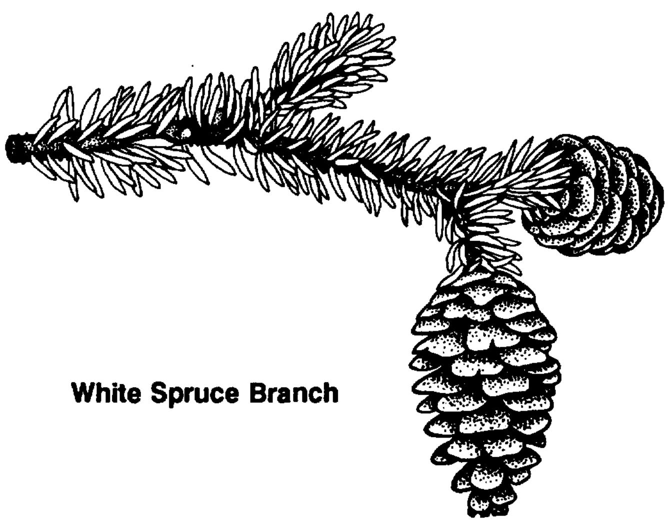
The distribution patterns of landcover types in the Beaver Creek watershed are fairly typical of patterns throughout Interior Alaska. The mosaic of vegetation communities within the watershed has developed in response to a variety of environmental factors, including climate, physiography, surfi-

cial geology, soil character, discontinuous permafrost, and disturbances such as fire, flooding, and human actions, including placer mining. Portions of the riparian zone in the upper reaches of the Beaver Creek watershed have been influenced by placer mining over the past 90 years, as have most other drainages in the Yukon-Tanana watershed.

3.5.2 Description of Vegetation Types

Most of the major landcover types typical of Interior Alaska are represented in the Beaver Creek watershed (Figure 3-3). The landcover types are based on the Alaska Vegetation Classification System (Viereck, et al. 1986 and 1987). This five-level classification system is specifically designed to describe vegetation associations from a general level (Level I including forest, scrub, and herbaceous) to a detailed description (Level V, which incorporates the scientific names of the species of plants in the associations).

The upland areas of the watershed are characterized by alpine tundra types and by a diversity of forest types whose distribution is affected by such factors as slope, aspect, soils, permafrost, and repeated fire patterns. Riparian areas along stream channels on current and former floodplains and old terraces support a variety of forest, shrub, and herbaceous types in various stages of succession, dependent upon a site's history of fire, floods, and mining.



White Spruce Branch

Alpine tundra and sparsely vegetated communities grow in the White Mountains above 3000 feet. The alpine tundra areas have plant associations of *Dryas* dwarf scrub, plants belonging to the ericaceous heath family; and dwarf scrub of bearberry, blueberry, and mossberry. *Cassiope* is widespread on moist alpine sites, as is willow tundra. The lichen components are variable and include fruticose and crustose growth forms.

Lower rolling slopes support communities of dwarf and low shrubs, and sedge/shrub tundra. Mixed in with the forest components are tall and low scrub communities of alder, willow, and ericaceous shrubs such as Labrador tea, and blueberry; and dwarf birch. On the better-drained slopes the ground layer may be composed of dry herbaceous plants, mosses, and lichens such as the *Cladina* groups (reindeer moss), and some graminoids. The poorly drained and wetter slopes are characterized by more alder and some willow with a ground layer of *Sphagnum*, sedge tussocks, other mosses, and foliose lichens like *Peltigeria*. Tussock tundra grows on the large, gentle, northwest-facing slopes between Colorado and Sheep Creeks.

LEVEL I CLASS	COMMUNITY	LEVEL IV CLASS	PLANT CANOPY DESIGNATION
Forest	Riparian	White spruce	closed, open, woodland
	Riparian	Black spruce	closed, open, woodland
		Black spruce-white spruce	closed, open, woodland
		Black spruce-tamarack	open, woodland
	Riparian	Balsam poplar	closed, open
	Successional	Birch	closed, open
	Successional	Aspen	closed, open
	Successional	Birch-aspen	closed, open
	Riparian	Spruce-birch	closed, open
		Aspen-spruce	closed, open
	Riparian, Successional	Poplar-spruce	closed, open
Scrub	Riparian	Tall willow	closed, open
		Tall alder	closed, open
	Riparian	Tall alder-willow	closed, open
	Riparian	Low willow	closed, open, sparse
		Low willow-alder	open
	Riparian	Mixed shrub-sedge tussocks	open
		Mesic shrub birch-ericaceous shrub	open
	Riparian	Ericaceous shrub bog	open
	Riparian	Shrub birch-willow	open
	Riparian	Willow-graminoid bog	open
Dwarf shrub		Dryas tundra	
		Dryas sedge tundra	
		Vaccinium tundra	
		Cassiope tundra	
		Willow tundra	
Herbaceous		Midgrass shrub	
		Midgrass herb	
	Riparian, Successional	Bluejoint-herb	
	Riparian	Tussock tundra	
	Riparian	Sedge-dwarf birch tundra	
	Riparian	Wet sedge meadow tundra	
	Riparian	Wet sedge-herb meadow tundra	
		Subarctic lowland sedge wet meadow	
		Subarctic lowland sedge moss bog meadow	
		Alpine herb-sedge	
		Fresh herb marsh	

Figure 3-3. Landcover types in the Beaver Creek watershed (Viereck 1986).

Deciduous forests occur on steeper southerly facing slopes on the west side of Beaver Creek below Colorado Creek. Black spruce and low shrub/moss types cover the gentle slopes between Nome and Colorado Creeks on both sides of the Beaver Creek drainage and along old terraces of Beaver Creek.

Open white spruce and white spruce/black spruce stands are commonly found on the drier, well-drained south and west-facing slopes throughout the watershed. Birch, birch/aspen, and spruce/ birch stands are vegetation associations found on these slopes, but are successional to stands of white spruce as the climax vegetation. Well-developed stands of birch may be found on silt loam ridges on these slopes. Open black spruce and black spruce/ aspen stands are common on poorly drained, cold sites on north and east-facing slopes. These slopes are underlain by permafrost.

A prescribed burn to improve wildlife habitat was conducted by BLM in summer 1987. The burn improved approximately 2,000 acres in the upper Bear and Quartz Creeks drainage. The original vegetation in the area of the burn was predominately sparse black spruce forest and spruce/birch mixed forest. Species characteristic of early successional stages, including willows, other shrubs, and herbaceous plants, have regrown in the burned areas.

Riparian

Riparian zones are defined by BLM as:

> "A specialized form of wetland restricted to areas along, adjacent to, or contiguous with perennially and intermittently flowing rivers and stream.... This habitat is transitional between true bottom land wetlands and upland terrestrial habitats.... Soils of the riparian habitat may not exhibit typical wet soil characteristics of other wetlands. If not, wet soil characteristics will exist close enough to the surface for the water to be used directly by vegetation. This vegetation may range from water-loving hydrophytes (such as pond weeds) through terrestrial forms (such as... cottonwoods, and willows)." (DOI 1979).

The vegetation communities in the riparian zone along the stream floodplain and lowland areas of the valleys are most impacted by placer mining, and will have the greatest variation in the resultant impacts associated with the various alternatives (Section 4.5). The riparian zone along Beaver Creek supports a community of white spruce and cottonwood in the lower reaches, and a community of low and tall shrubs in the upper parts of the drainage. The areas of Nome Creek which have been dredged are mostly barren, with some shrub regrowth.

The closed needle/leaf forest (canopy cover greater than 60%) types include white spruce along the rivers and drainages located on well-drained permafrost-free soils, black spruce generally occurring on poorly drained organic soils which are often underlain by permafrost, and black spruce/white spruce forests on the river terraces. The closed broadleaf forest (canopy greater than 60%) is represented by the balsam poplar which occurs most frequently on river floodplains. There is a closed, mixed forest type of poplar/spruce which is an intermediate successional stage leading to the white spruce climax on floodplain sites.

Tall scrub includes willow thickets which are especially characteristic of floodplains and river banks, and shrub swamps of alder and willow which occur on floodplains and in drainageways.

Low scrub stands occur in wet stream bottoms, poorly drained lowlands underlain by permafrost, and floodplains. These communities include dwarf birch/ericaceous shrub bog, mixed shrub/sedge/tussock bog, ericaceous shrub bog, shrub birch/willow, and willow/graminoid bog.

Recently disturbed gravel bars and tailings support sparse shrub communities, usually willow, alder, and balsam poplar seedlings.

Wet sedge/herb meadows and lowland sedge wet meadows are common on very wet, poorly drained sites with standing water, such as oxbow lakes, floodplains, and margins of ponds, lakes, and sloughs. Another herbaceous type is the pioneering community of grasses and forbs on recently disturbed gravel bars or tailings.

Wetlands

Wetlands, an important component of the ecosystem, act as a buffer for water quality effects, and are subject to long-term effects after disturbances.

> "Wetlands play a major role in maintaining hydrologic systems and the quality and quantity of surface and ground waters. Some wetlands can absorb large quantities of water and act as natural flood control systems for rivers by gradually releasing floodwaters and reducing the magnitude of high flows. Wetlands may slow the rate of runoff during periods of normal rainfall and help recharge aquifers. In some places, sediments and pollutants may be filtered out of water draining through wetlands, and water quality may thus be improved. Wetlands are extremely important to resident and migratory birds for resting, feeding, and nesting and can be important foraging grounds for large mammals such as caribou, moose, and bear." (DOI et al. 1987f).

Wetlands have been defined by the Corps in 33 CFR 328 as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." The Corps definition allows that any vegetated area which is underlain by ice-rich permafrost typically meets the wetland definition. Therefore, many areas in the Beaver Creek watershed which are below the alpine zone are wetland in character and subject to Corps jurisdiction under Section 404 of the Clean Water Act. Other definitions of wetlands which are commonly used in Alaska are based on water saturation of the upper strata of the substrate, and standing water at the surface. These types usually do not include all black spruce and many scrub communities as wetlands.

DOI defines wetland or wetland habitat as:

> "Permanently wet or intermittently flooded areas where the water table (fresh, saline, or brackish) is at, near, or above the soil surface for extended intervals, where hydric wet soil conditions are normally exhibited, and where water depths generally do not exceed 2 meters. Vegetation is generally comprised of emergent water-loving forms (hydrophytes) which require at least a periodically saturated soil condition for growth and reproduction. In certain instances vegetation may be completely lacking. Marshes, shallows, swamps, muskegs, lake bogs, and wet meadows are examples of wetlands. (DOI 1979).

3.5.3 Successional Patterns

The major causes of disturbance in the Beaver Creek valley are wildfires and placer mining. After a site has been disturbed, a series of vegetation communities sequentially develop, one gradually replacing its predecessor in a systematic, successive manner. The process of succession is "the more or less orderly pattern of events and processes in nature whereby plant and animal species replace each other as a result of a changing environment" (Komarek 1971). The rate of succession results from the type, frequency, duration, and intensity of disturbance, and the basic environmental factors of a site. One simplified example of succession would be vegetation types of grass and forbs, replaced by deciduous shrubs, which are replaced in turn by a climax community of coniferous trees on a site. A disclimax community is maintained in an area subject to continuous repeated disturbance (Daubenmire 1968). For example, aspen and birch stands are often maintained on south-facing slopes by repeated fires when white spruce would be the "normal" climax stage.

Succession in Mined Areas

Succession in placer mine tails depends very heavily on the percentage of fine-grained materials or "fines" in the substrate (Holmes 1981, Rutherford and Meyer 1981). Fines (particles of silt and clay size) directly control the water, oxygen, and nutrients available to plant root systems, and the quality of the initial seed or rooting bed. Other important considerations are micro-relief and sources of seed or vegetative propagules. Vegetation of mine tailings is considered an example of primary succession because the tailings are usually undifferentiated mineral materials with little or no organic content or seed bed.

Typically, mine tailings are initially invaded by annual grasses and forbs such as *Calamagrostis* and fireweed, with lupine and other legumes following. Scattered seedlings of willow and alder invade next, intermixed with birch or balsam poplar in some locations. Rose or bearberry may also occur, and initial bryophytes are usually *Stereocaulon* and hairy cap moss.

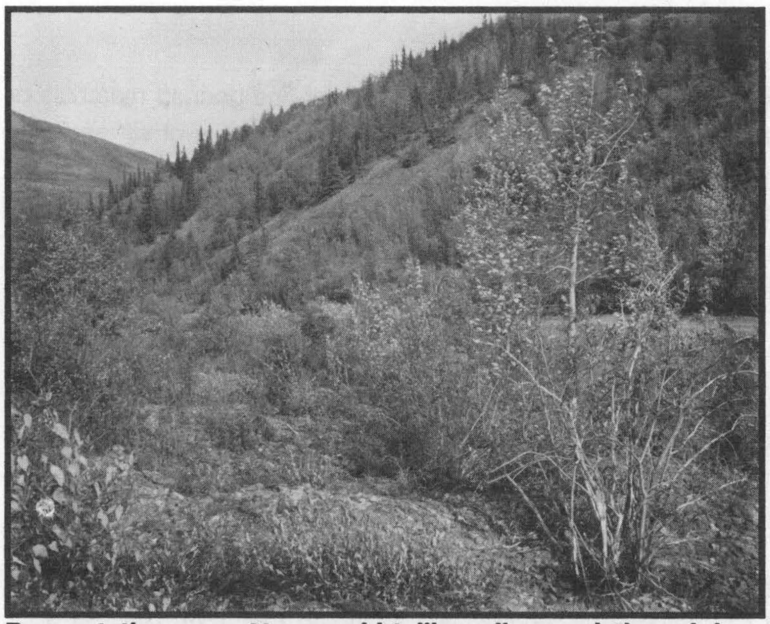
As the cover of shrubs expands, the ground cover increases and more species become established. Mosses such as *Hylocomnium* and *Drepanocladus*, and lichens including *Peltigera*, *Cladina* spp., and *Cladonias* comprise the ground cover. At this stage, ericaceous shrubs usually colonize, includ-

ing blueberry, cranberry, Labrador tea, and mossberries. Spruce seedlings also begin to grow under the shrub cover during this period. The composition of the resultant community may be fairly stable for decades.

In cooler and wetter areas, the organic layer accumulates, *Sphagnum* mosses flourish, and permafrost redevelops. Eventually, a black spruce/low shrub/*Sphagnum* moss type covers the site.

In warmer, well-drained areas, a mature, single-aged birch and/or aspen stand usually develops, with alder, willow, and white spruce saplings in the understory. If left undisturbed for a long enough period, mature white spruce with scattered birch, aspen, or balsam poplar develops on the site. Riparian communities often develop old stands of 200-300 year old white spruce and balsam poplar. Above the limits of tree growth, riparian zones usually consist of tall willow and alder.

The rate of succession seems to be heavily influenced by the proportions of particles of silt and clay size in the surface layer of the tailings. Rutherford and Meyer (1981), reporting on 30-40 year old communities on dredged tailings in the Tuluksak River, documented that the growth of sparsely vegetated shrubs through dense tall shrub stands depended on soil particle size. With an increase in fines from 10% to greater than 50% there was a corresponding increase in the amount of cover, vegetation height, and species diversity. Holmes (1981), working on 50 year old dredge tailings on Goldstream Creek at Fox, reports similar findings, with slightly longer time frames. This would be in keeping with the more northerly site. Halloran (1986), working on both recent and old tailings in the Birch Creek drainage, Circle mining district, found that vegetation development was enhanced in areas with greater fines content. This work included data on an undisturbed site with fines content of greater than 50%, while tailing samples ranged from less than 10% to approximately 50% fines.



Revegetation on a 40-year-old tailing pile consisting of dry gravel with a small amount of fine materials.

Observations by BLM (Spencer 1987) during the summer of 1987 support these interpretations. Small willow seedlings from five to seven years old located on tailings with moderate fines content on Faith and Portage Creeks were seen, along with tall willows aged 17 years on tailings over 30 years old at the tailings/water interface on Deadwood Creek, a tall alder/willow community on old, well-drained tailings aged approximately 40 years on Switch Creek, and dense grasses and willow shoots covering areas that had been stripped the previous year, but not sluiced.

Fire Succession

Past fire history and fire patterns have also influenced the distribution of landcover within the watershed. Fire changes the relationships between the plant and animal communities, as well as between the plants and the climate.

Often fire has positive effects. For instance, the ash resulting from fires is high in calcium, potassium, phosphorous, and other minor elements that have been released from the organic matter in a usable, soluble form. Releasing these nutrients from the biomass is beneficial in the Alaskan environment because other processes of nutrient recycling such as weathering, decay, and oxidation are exceedingly slow in the arctic and subarctic biomes. The variations caused by fire burning patterns and the adaptations of different plant species to fire also create a complex mosaic of plant communities and ecotones in various stages of succession. These plant communities provide habitats for a large variety of animal species. Fire creates more variations in both plant and animal communities than probably any other natural force. For example, in much of the forested areas, the variations of fire intensity and frequency determine whether the affected region will be occupied by moose or caribou. In waterfowl nesting areas where fire reduces the graminoid cover, predation on the waterfowl is often decreased due to greater visibility of the predators. Fire-scarred landcover has a visual impact on the esthetic qualities of an area for recreation utilization for many years after a burn (Komarek 1971).

Revegetation

Often fire or fire suppression activities affect the thick vegetative mats that have a principal insulating effect on the soil thermal regime. When this mat is altered, the frozen subsoil, often rich in silt, is released when the permafrost melts. Surface slumping and sedimentation of streams are common results of this thermal disruption and can affect even flat terrain. The overall moisture relation and thermal effects from fire are more pronounced on the south-facing slopes where the moisture balance is more critical (Lotspeich and Mueller 1971).

Lotspeich and Mueller (1971) speculate that the vast majority of Interior Alaska has been burned over within the past 200- 250 years, though that time period could possibly be too long when compared to the normal species rotation ages. They estimate rotation ages of white spruce at 100-150 years, birch at 80- 100 years, aspen at 60-80 years, and black spruce at 60-80 years.

Fire has less impact on white spruce stands which are found on valley floors and terraces of the riparian zone where the burning may be less severe. White spruce also lack ladder fuels, which reduces their susceptibility to crown fires. Black spruce, which frequently burns, is well adapted to fire because of serotinous cones which can release a viable seed crop shortly after a fire. However, repeated fires can convert spruce areas to birch and aspen stands which are then maintained as a disclimax. Deciduous broadleaf trees, due to the nature of their branching, are not so affected by crown fires. Aspen usually regenerates by vegetative reproduction from root suckers if the fire does not burn down to the mineral soil (Barney 1969).

3.5.4 Threatened and Endangered Plants

Within the Beaver Creek drainage there are no formal "listed" or "candidate" threatened or endangered plant species. Candidate species are those plants included in the Federal Register "Notices of Review" listing that are being considered by the Fish and Wildlife Service (USFWS) for listing as threatened or endangered. Threatened plant species are those so restricted in distribution that they are likely to become endangered. The designation of endangered status means that a species may be lost throughout all or a significant part of its region due to current or planned activity. The BLM has developed a category of "endemic" species for use in managing public lands. The intent is to encourage better management practices to prevent these species from being listed as threatened or endangered. Candidate species are those considered vulnerable because of a significant current or predicted reduction of populations, numbers, or habitat (Murray and Lipkin 1987). Beaver Creek watershed contains one endemic species, *Poa porsildii.* These species are native to the area where found. Beaver and Birch Creek drainages are the two known localities in which this plant exists in Alaska. It also occurs in a few more areas in the Yukon Territory, with the main concentration being in southwestern Canada. It is usually found around persisting snow beds within dry alpine areas (Hulten 1968). The presence of additional sensitive species existing within the watershed of Beaver Creek is a distinct possibility because some localities are so remote that collections are sparse. Taxonomic studies are being inventoried, but at this time they are incomplete.

3.6 Wildlife

Introduction

Terrestrial wildlife includes all animals that inhabit the upland and riparian portions of the physical environment. The mammal and bird species of most importance to humans for food, recreation, or economic purposes, and their associated habitats are emphasized in this analysis.

Wildlife habitat provides food, cover, water, and living space. Habitat is used by wildlife for all life-sustaining activities including breeding, foraging, drinking water, hiding and resting, and movement and protection. The number, types, and availability of wildlife habitats present and how they may be affected by mineral development in the area can be better understood by focusing on vegetation, a principle component of terrestrial habitat. The various successional communities of vegetation are

primarily a function of the frequency and distribution of disturbances like fire, and the substrate (soils) in the area. These vegetation patterns play an important role in influencing habitat diversity and, therefore, the number and type of habitats utilized by the various species.

Species and Habitats Present

Red Fox

The combination of rugged mountain peaks of the White Mountains, and rolling hills and many stream valleys of the upper Beaver Creek watershed provide habitat for many species typical to Interior Alaska. Caribou, moose, Dall sheep, grizzly bear, black bear, and wolf are the big game species most commonly present. Furbearers of economic importance in the area include marten, lynx, red fox, beaver, otter, and mink. Small game species include spruce, ruffed, and sharp-tailed grouse; willow and rock ptarmigan; and snowshoe hare. The peregrine falcon, an endangered species, inhabits the area as do other raptors, including the bald eagle and red-tailed hawk. Many non-game mammal and bird species are also found throughout the area. The upper reaches of Beaver Creek support relatively few numbers of breeding waterfowl due to the narrow floodplains of the river and stream valleys. Waterfowl use occurs in this area during spring and fall migration periods. Beaver Creek drains north into the Yukon Flats where extensive lowlands and broad floodplains support large numbers of breeding ducks, geese, swans, and cranes. Additional information concerning species descriptions and distributions is available in "Alaska's Wildlife and Habitat" (ADF&G 1978a), "Alaska Wildlife Management Plans - Interior Alaska" (ADF&G 1976), and "Alaska Habitat Management Guide for Mammals, Birds, and Human Use" (ADF&G 1986b).

The White Mountains and Fortymile Caribou Herds

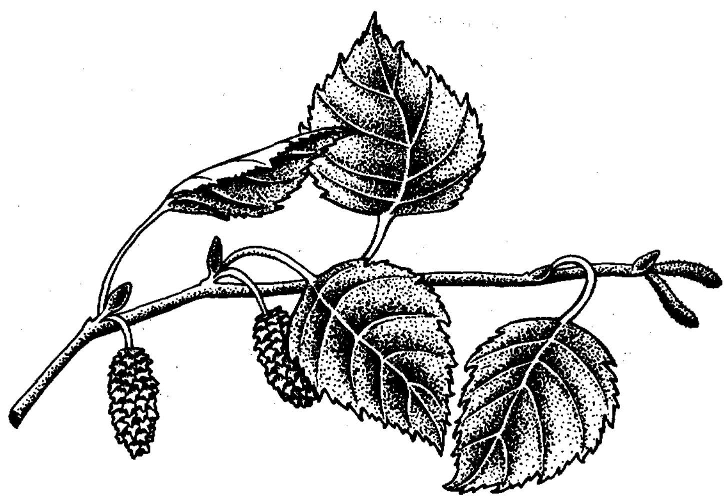
The area contains year-round habitat for the White Mountains caribou herd (see Caribou Range Map) and has been historically occupied by the Fortymile caribou herd. The White Mountains caribou herd currently numbers approximately 1,000 and may have arisen from remnants of the larger Fortymile herd of the 1950's. At present, winter range of the White Mountains herd is west of Beaver Creek in the upper Tolovana River and Victoria Creek watershed. Summer use areas of the White Mountains caribou are primarily in the upland areas of the White Mountains (Cache Mountain, Lime Peak, Mt. Prindle). The Fortymile herd still uses the Lime Peak and Mt. Prindle areas during summer and fall (Durtsche 1984a). During years in which the Fortymile herd numbered approximately 50,000 or more (1930 to 1962), the principal calving area was in the White Mountains, and movements traversed the Steese Highway between the Twelve Mile Summit and Eagle Summit

areas (Davis, et al. 1976) (Caribou Range Map). Recently the Fortymile Herd has increased from a low of about 5,000 in 1976 to the current estimate of approximately 16,500 (Valkenburg and Davis, pers comm). The current ADF&G population goal is 50,000 caribou.

Dall Sheep

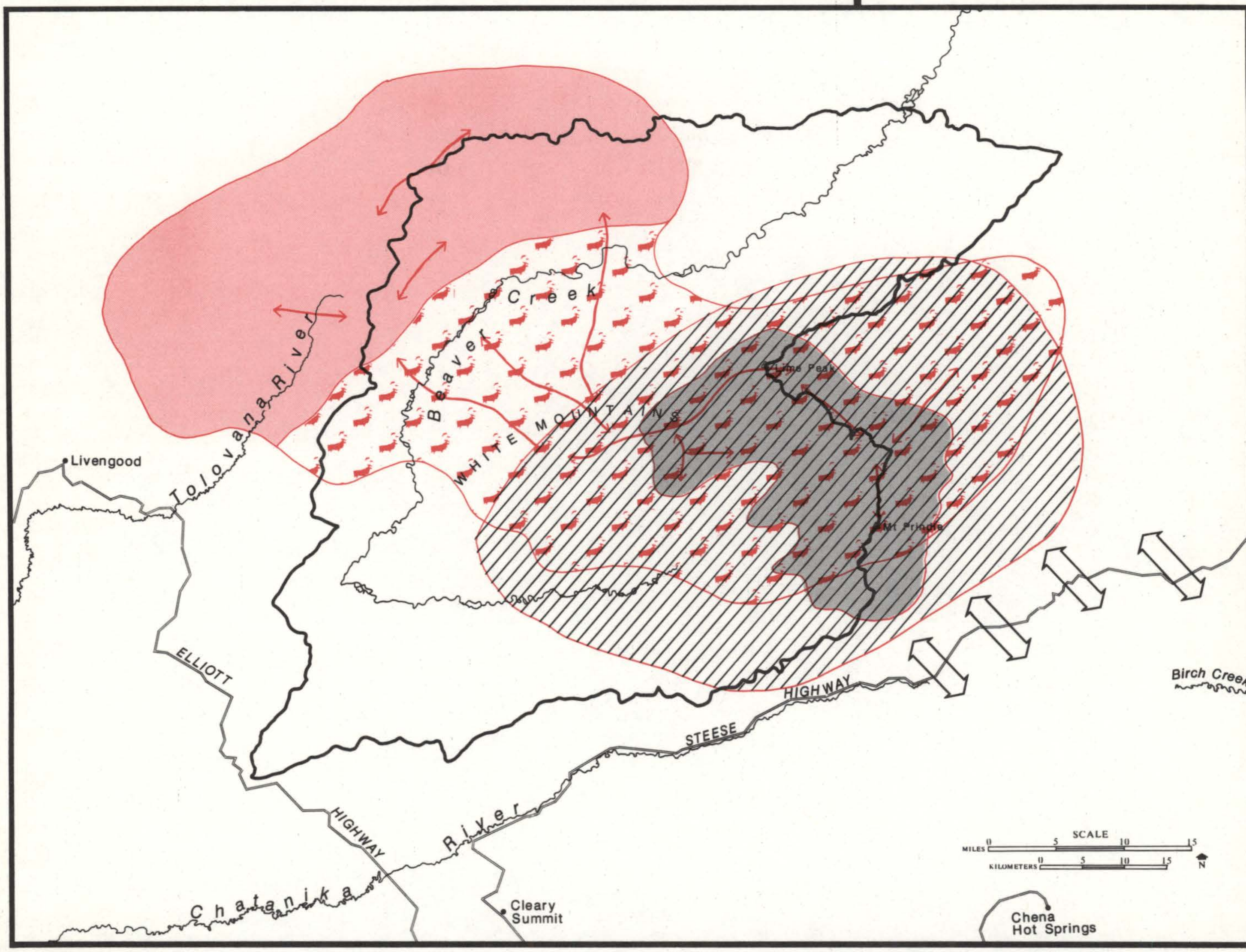
Dall sheep occupy alpine areas in the vicinity of Mt. Prindle, Lime Peak, Cache Mountain, White Mountains proper, Victoria Mountain, and Mt. Schwatka (Dall Sheep Range Map). Current numbers of approximately 240 probably represent a stable population after a decline of about 60% during the early 1970's (Crain and Durtsche, unpub. data). Sheep habitat is limited by a relative shortage of escape terrain and areas over 2,500 feet in elevation. Sheep often travel considerable distances through forested areas to reach mineral licks or other suitable habitat (Durtsche 1984b). This combination of forested areas and the scarcity of rugged escape terrain in the alpine areas may make these sheep vulnerable to predation and the disruption of traditional movements and seasonal use areas.

Moose



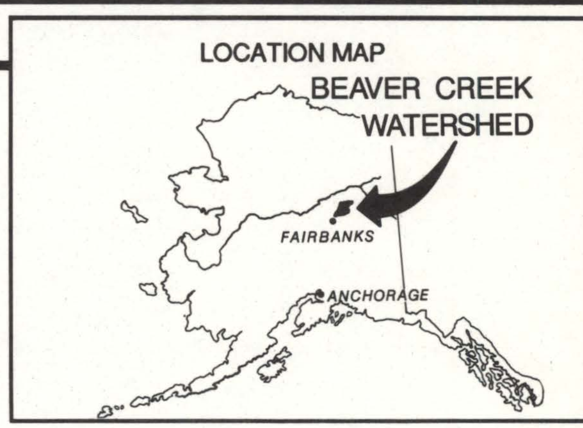
Birch Branch

Moose populations in the area are relatively low. The population is not increasing due to high mortality of calves during the summer months (Nowlin 1987). Predation by bears and wolves appear to be the main causes of calf mortality (Durtsche, unpub. data). A total number of approximately 400 moose seen during a 1985 survey (Haggstrom and Durtsche, unpub. data) on upper Beaver Creek may indicate a stabilization in the population following the downward trend of recent years. Moose habitat is dominated by spruce forest, with stands of riparian willow along rivers and streams which provide important late winter browse (Moose Range Map). Early successional stages of vegetation following fires are commonly utilized by moose in early winter, but are only a small portion of the moose habitat in the area. The quantity and quality of moose range in the overall area has been reduced by past wildfire suppression activities and habitat loss from placer mining in the Nome Creek valley. Recent investigations concerning moose seasonal distribution and habitat use in upper Beaver Creek indicate a portion of the moose population wintering in Beaver Creek utilize areas in the Fairbanks vicinity during spring calving, summer, and fall (Durtsche, unpub. data). The preliminary data indicate that availability, quality, and quantity of winter range utilized by moose in upper Beaver Creek may influence the number of moose available for human use in the Fairbanks area.



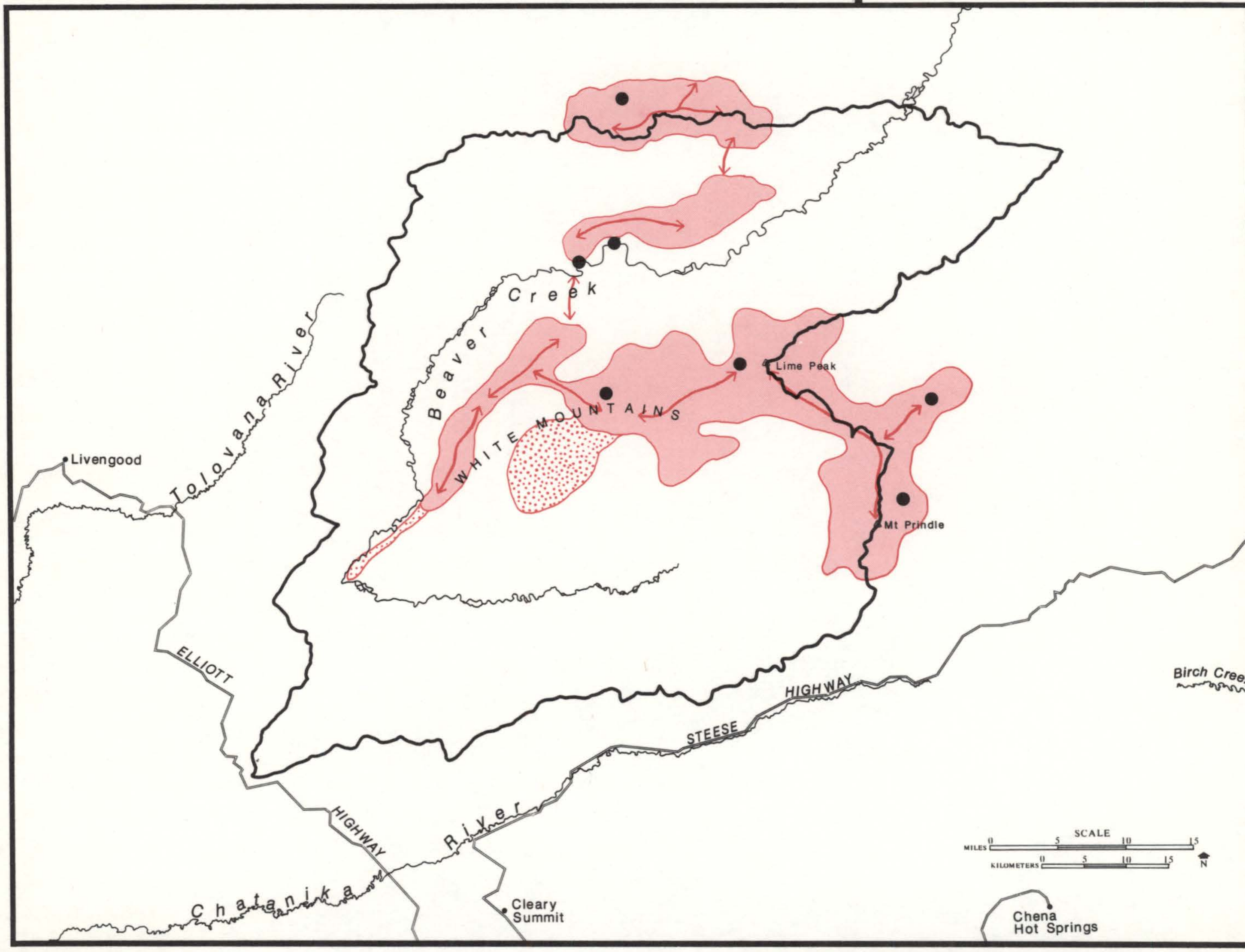
Legend

- Winter distribution of White Mountain caribou herd
- Summer distribution of White Mountain caribou herd
- Movement routes of White Mountain caribou herd
- Historic calving area for Fortymile caribou herd 1950-1962
- Historic core calving area for Fortymile caribou herd 1950-1962
- Principal historic movement routes for Fortymile caribou herd in White Mountains



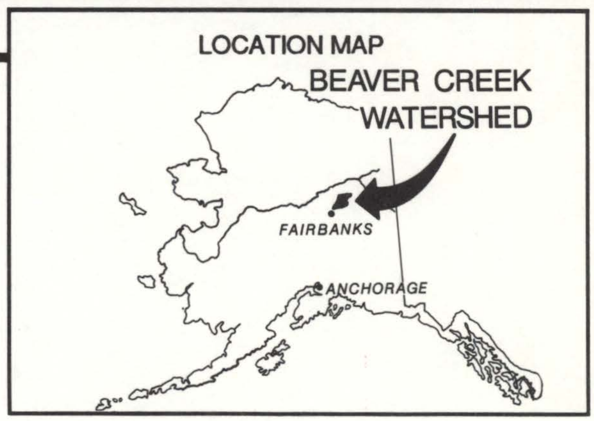
Wildlife

Dall Sheep Range

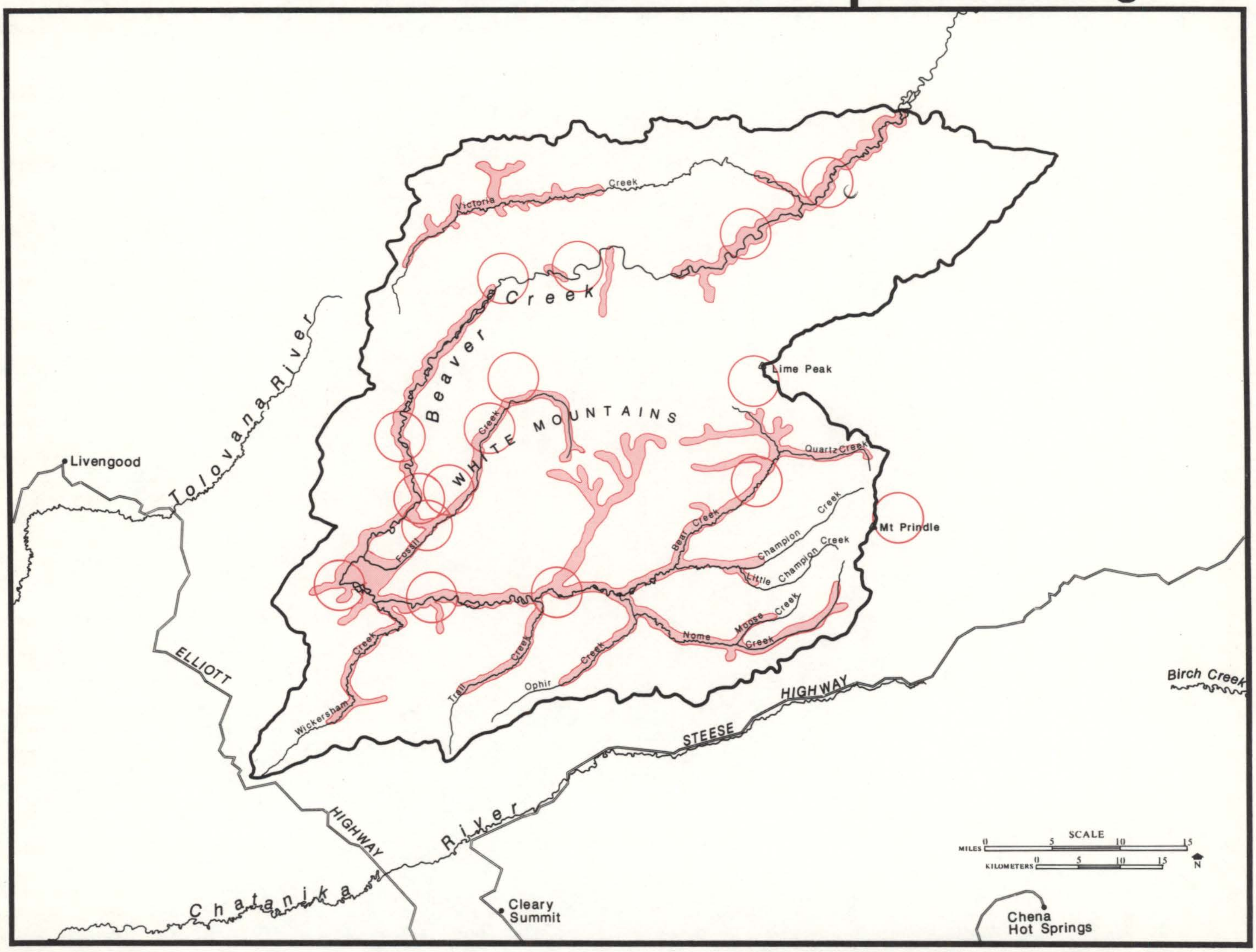


Legend

- Present distribution of Dall sheep in White Mountains
- Historic distribution of Dall sheep in White Mountains
- Movement route
- Mineral lick



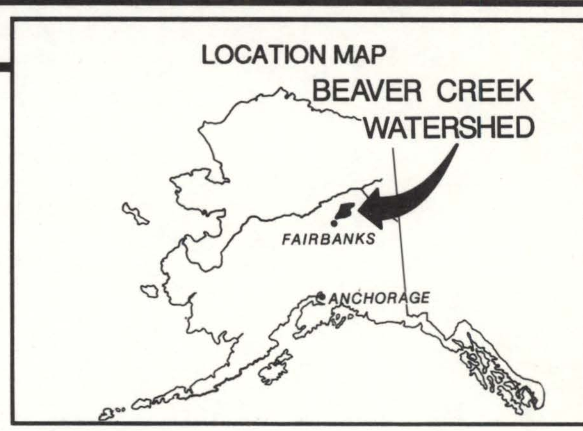
Wildlife
Raptors and Moose Range



Legend

Winter high use areas for Moose

Known raptor nesting habitat



Other Species

Little data are available for location of crucial use areas, population numbers, trends, productivity, or survival of grizzly bear, black bear or wolves. Similarly, specific data on population size, trend, productivity, and use areas for raptors (Wildlife Raptors and Moose Range Map), furbearers, small game, and non-game species are also lacking.

Present Situation in Relation to Mineral Development

Construction of approximately 7.2 miles of permanent gravel roads in the Beaver Creek watershed has resulted in the permanent loss of 44 acres of wildlife habitat in the Nome Creek drainage. The establishment and use of 23.3 miles of primitive roads and trails, in addition to permanent roads, has resulted in 19,200 acres of wildlife habitat being subject to short-term periodic disturbance by vehicular traffic when wildlife such as moose, caribou, and others are present. The present low level of vehicular use of roads and trails is periodic and has not resulted in significant alteration of wildlife movement routes, or disturbance or disruption of seasonal use areas. Improvement and expansion of access trails into Quartz Creek and other areas of Beaver Creek has indirectly resulted in increased harvest pressure on moose, caribou, Dall sheep, grizzly bear, black bear, and other species. Improving access and establishing new access for mining and other activities into remote areas has indirectly facilitated wildlife habitat loss and disturbance in wildlife use areas over the long term.

The presence of facilities and structures associated with mining activities in Beaver Creek has resulted in the long-term loss of two acres of winter range for moose in the Nome Creek drainage. Similarly, 18 acres of riparian habitat used by moose and other species are unavailable for the short term due to frequent human disturbance near the facilities during May through October. Grizzly or black bears have been removed as nuisance animals because of their attraction to refuse or other solid waste in the vicinity of mining facilities.

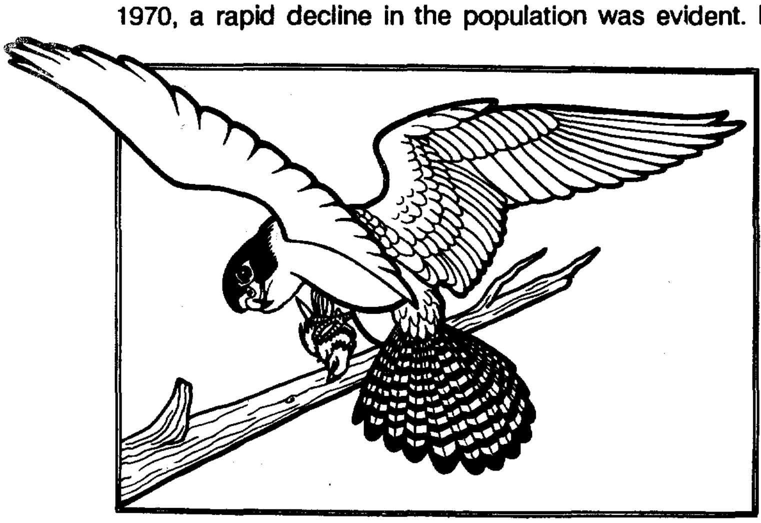
Activities associated with stripping, mine cuts, stockpiles, and settling basins have resulted in physical alteration of about 352 acres of moose winter range in the Nome Creek valley. Approximately 310 acres of this previously-mined habitat has recovered over the last 40-50 years to provide about 30-50 acres of usable browse for moose. Since 1984, about 40 acres of the previously-mined area has been mined again. Reclamation of the 40 acres has been facilitated through spreading of tailings. Revegetation in this area has and will continue to require approximately 50 years (Figure 4-2) to reach a stage suitable as moose browse. Short-term avoidance during the summer mining season of approximately 502 acres of riparian and upland habitat also occurs in the Nome Creek area due to noise from machinery and other mining activities. The possibility of hazardous materials spills such as diesel fuel has been recognized, but no appreciable contamination or loss of wildlife habitat has been known to occur.

Conclusions

Between 300-320 acres of moose late winter range have been physically altered by mining-related activities in the Nome Creek area of Beaver Creek. Disturbances to wildlife due to use of roads and trails, operation of vehicles, machinery, and human habitation in the Beaver Creek watershed has resulted in a minimum level of short-term adverse effects in localized areas during the summer. Minimum harvest of wildlife resulting directly from mining activities has occurred in Beaver Creek. The principle long-term adverse effect of mining in the Beaver Creek watershed is the loss of between 32-34% of the moose late winter range in the Nome Creek watershed. The long-term loss of habitat to mining in this portion of Beaver Creek may have contributed to a slight to low level reduction in moose population potential.

3.6.1 Threatened and Endangered Animals

The only threatened or endangered species present within the Beaver Creek watershed is the peregrine falcon. Peregrine falcons nest in the boreal forest of Interior Alaska, where historical populations were quite substantial, especially in the Yukon, Porcupine, and Tanana River basins. The Beaver Creek watershed contains extensive areas of suitable nesting habitat along streams and upland areas, with five to eight breeding pairs present annually (Wildlife Raptors and Moose Range Map). Nesting sites have been identified within the Beaver Creek Wild River Corridor and have been monitored annually (Durtsche, pers. comm.). The regional population of the peregrine appeared to be quite stable until the mid 1960's, except for local minor reductions in numbers (USFWS 1982). By 1970, a rapid decline in the population was evident. Data suggest that the principal cause for the decline was due to chlorinated hydrocarbons (DDT metabolites). High concentrations of these pesticide residues in breeding peregrines resulted in eggshell thinning and ultimately lower reproduction numbers. The birds obtained the pesticide from contaminated prey on their breeding and wintering areas, as well as en route to and from their wintering areas in Central and South America. Other factors contributing to the overall reduction in breeding populations were egg collection, human-caused disturbances, and habitat destruction.



Peregrine Falcon

Because of strict pesticide control and protective management nationwide, the overall population of the peregrine falcon has been steadily increasing over the last few years. Numbers of breeding pairs in the main nesting areas in Interior Alaska have come close to historic levels, and it appears the population is approaching levels to allow dispersal into other drainages where reoccupation of his-

toric nest sites and other nesting habitat is occurring (Ambrose, pers. comm.). Maintenance and protection of breeding habitat is a basic step towards establishment of a self-sustaining population (USFWS 1982). Protective measures relating to peregrine falcons are located in Section 4.6.7.

3.7 Fisheries

Fisheries resources include fish and benthic organisms that depend on bodies of water for all or part of their life cycle. There are four basic physical requirements for optimum fisheries habitat:

1) **Streamflow:** the volume of water carried in a stream and the gradient of its flow. Relatively stable streamflows without extreme freshets and droughts characterize the better fish streams.

2) **Substrate:** the bedrock, boulders, cobbles, gravels, sands, and silts making up the streambed. Spawning requires clean, stable gravel of various diameters, depending on fish size, which permits an intergravel flow of water adequate to provide embryos and alevins with good concentrations of dissolved oxygen and to remove metabolic wastes.

3) **Cover:** the plants, rocks, deep water, turbulence, shade, and organic debris used by fish for shelter and protection from adverse conditions and predation. Cover also provides feeding stations, food sources, and overwintering sites. Streamside cover or vegetation provides insect drop and allochthonous matter.

4) **Migration Route:** used for movement by adult fish upstream to spawning and feeding areas, and by fry and juveniles seeking rearing habitat.

In determining effects of mining practices on fisheries, the primary emphasis is on potential changes to fish habitats. Habitat may be altered by physical changes to the channel, or by changes in biologic components necessary for fish production.

Beaver Creek's designation as a component of the Wild and Scenic Rivers System is based on its primitive character, exceptional grayling fishing, aesthetic qualities, abundant wildlife in the river corridor, outstanding novice and family canoeing, good water quality, and other outstanding recreational opportunities. In this discussion, upper Beaver Creek is the area above the confluence of Moose Creek within the White Mountains National Recreation Area.

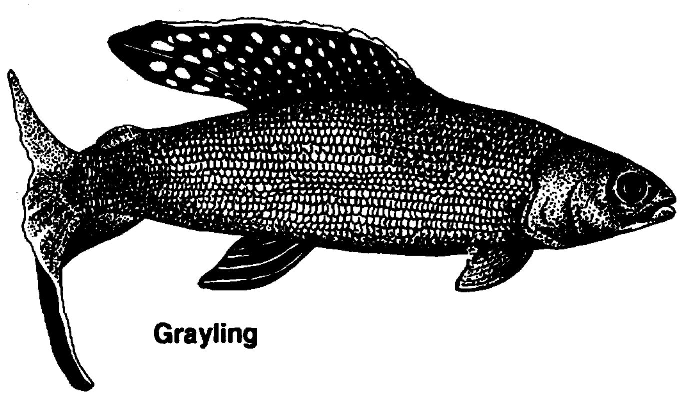
Species Present

Anadromous and resident fish species occur in the Beaver Creek drainage. Only limited data are available for resident species, notably arctic grayling. Fish species found in the portion of the streams which lie within the White Mountains National Recreation Area include arctic grayling, round whitefish, burbot, sheefish, northern pike, slimy sculpin, longnose sucker, chinook salmon, and chum salmon.

Salmon are present in limited numbers in Beaver Creek as determined from observations of live fish or carcasses along the shoreline (ADF&G 1987b). Upper Beaver Creek is not a salmon spawning stream of any consequence (Webb 1982). With the exception of slimy sculpin and the longnose sucker, species description and distribution maps can be found in "Alaska's Fisheries Atlas" (ADF&G 1978b, c). The majority of data collected for Beaver Creek resident fish address summer distribution and aspects of life history; limited work has been done concerning overwintering aspects of fish biology in this drainage.

Habitat

Aquatic habitat is generally pristine with the exception of the Nome Creek tributary where placer mining for gold continues. Both permanent and temporary habitats are used by fish, especially grayling, and this use depends upon the water levels and flows in Beaver Creek. Rising levels and increased flows cause inundation of backwater areas, side channels, oxbows, and depressions along the shoreline. Grayling seek refuge in these habitats to rest, feed, and escape predation and fast flows. Some fish may become trapped in these backwaters and oxbows when water levels drop, and those remaining may die due to insufficient depth to sustain them over the winter (DOI 1987c).



Grayling

Habitat requirements for anadromous and resident fish species in Beaver Creek for spawning, rearing, migration routes, and overwintering areas need further verification and documentation. However, previous fishery studies (Webb 1982-86) found that grayling spawning habitats may be available throughout Beaver Creek. Upper Beaver Creek is utilized to a limited extent for spawning based on studies by Rhine (1985) and Kretsinger (1986). Data are not available on precisely when or where grayling spawning occurs in Beaver Creek. Apparently spawning occurs downstream in late May. In upper Beaver Creek and isolated areas, spawning may take place in the middle or latter part of June.

Rearing areas for fish species in Beaver Creek vary and overlap somewhat. In July 1986, observers (DOI 1987c) reported grayling fry and fingerlings in the shallow backwater and depressions along the mainstem. Large springs above Wild River mile (WRM) 39 may serve as a rearing site for species other than grayling. Sloughs connected to Beaver Creek were observed to be seasonally utilized by fry, fingerlings, and adults for rearing and feeding.

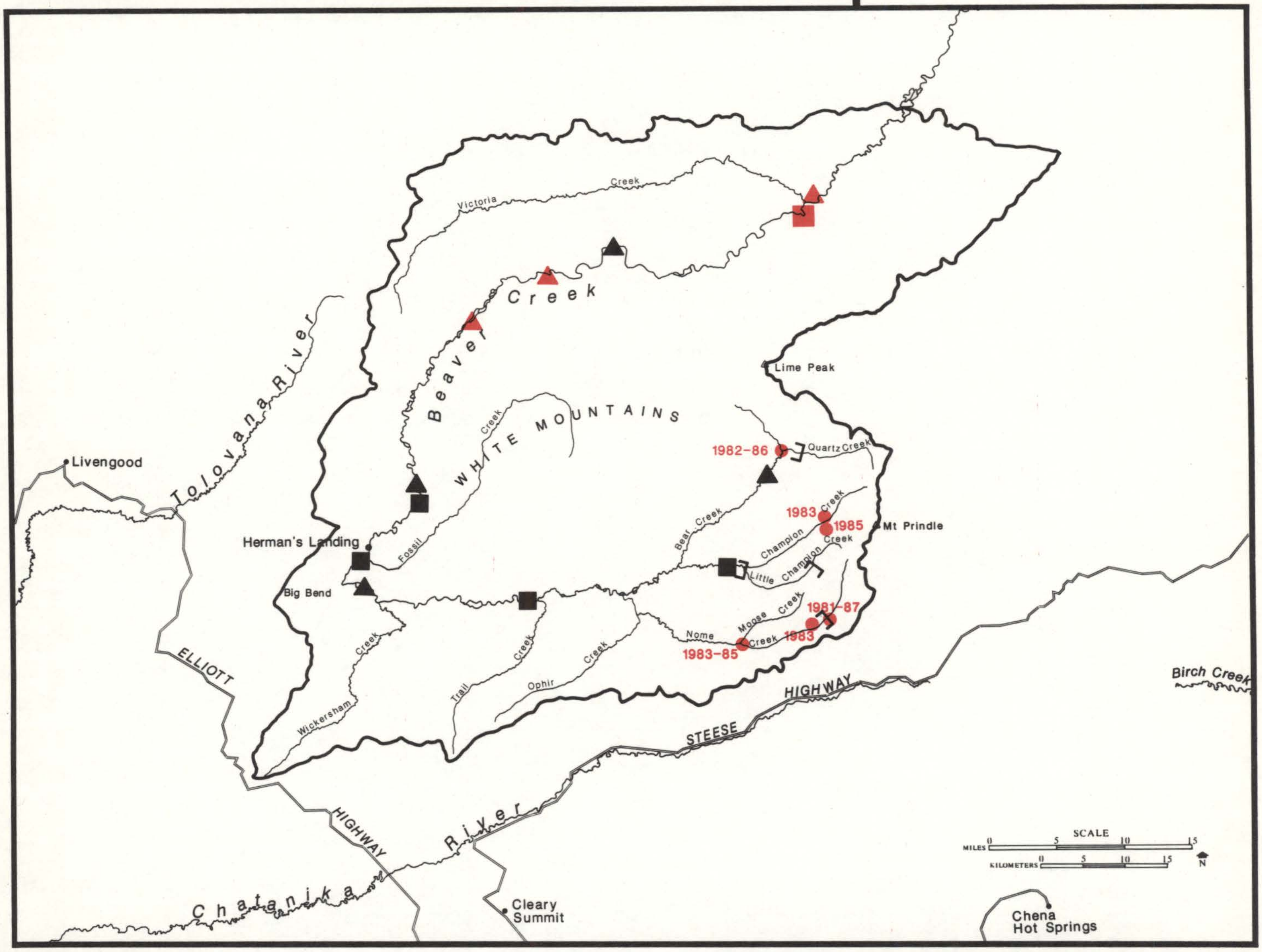
Migration routes are not precisely known, but it is believed that the mainstem serves grayling movements up and down Beaver Creek. Grayling migration through the disturbed area of Nome Creek (a Beaver Creek tributary) may be impeded by high water velocities and lack of pools (Post 1986b, Post 1986a) caused by the presence of dredge tailings and channelization. The stream splits at

Beaver Creek

FINAL

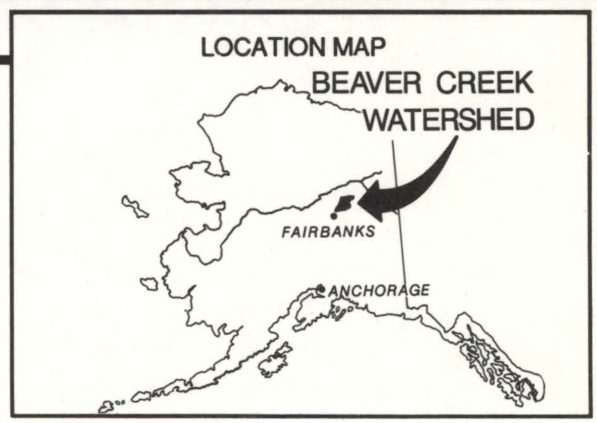
Cumulative Environmental Impact Statement

Fisheries



Legend

- Locations of observations of chum salmon
- Locations of observations of chinook salmon
- Location of recent mining activity from Annual Placer Mining Applications
- Observed overwintering area for fish
- Potential overwintering area for fish
- Most upstream recorded observations of arctic grayling



several locations and rejoins at several points downstream. Because of this diversion the mainstem appears to be the primary route based on depth and flow. Possibly all species use the mainstem for movements within Beaver Creek (ADF&G 1987b).

Overwintering areas may exist throughout the Beaver Creek watershed, but are possibly in very short supply in extreme upper Beaver Creek. One site has been delineated about a mile above WRM 39 (Webb 1986). It is here that several large springs keep a two-mile river section open during the winter. Other overwintering areas for Beaver Creek have been delineated by Webb (1982-86).

The main channel pools provide crucial overwintering habitat in Beaver Creek. Also, pools serve as feeding, escape cover sites, and resting areas during migrations. Winter water availability for fish overwintering is in low supply due to low base streamflow in the upper Beaver Creek (Webb 1982). Any loss of pool depth would adversely impact the overwintering survival of all Beaver Creek fish. The few deep water pools provide the prime refuge for adult fish in upstream areas. Adult fish movements between pools is essentially impossible in low flow areas. Based on winter observations (Webb 1982), the potential deep pool refuge areas for adult fish during late winter must be at least eight feet deeper than the upstream riffle to maintain a four-foot water depth below the ice. Therefore, no reduction in winter low flow can be tolerated by fish.

Limited information is available regarding aquatic macroinvertebrates. Stomach contents of 63 grayling examined in 1986 indicated that 75% of the food consisted of beetles, crane and black flies, mayflies, snails, nematodes, chironomids, and caddisflies (DOI 1987c). Mayflies were found to be the most abundant invertebrates in Beaver Creek. Rhine (1985) examined Bear, Quartz, and Champion Creeks and classified these streams as being less productive for invertebrates, containing only moderate populations of a few species.

Water Quality and Stream Flows

Limited water quality data for Beaver Creek and its headwater tributaries are available (DOI 1987c). BLM obtained grab water quality samples from 12 locations on Beaver Creek in July and August 1986 (Figure 3-2) and analyzed them for specific conductance, acidity, total dissolved solids, total suspended solids, total solids, and percent of volatile organics (DOI 1987c). In general, Beaver Creek has good water quality and the analysis suggests that most of the turbidity consisted of organic material at all but the highest flow (DOI 1987c, Table 12). See USFWS (1988) for heavy metal concentration water sample tables.

Spring runoff and summer rainfall provide flows needed to sustain fish species; however, the critical need is during the winter. No published data were available on mid-winter baseflow conditions on Beaver Creek. However, Webb (1982) noted long reaches of open water below WRM 39, along the flank of the White Mountains. In addition, several prominent groundwater upwellings were observed in this reach. It is hypothesized that the White Mountains, a limestone formation, provide significant groundwater to Beaver Creek between WRMs 39 and 45. Unpublished USGS data suggests that 1951 midwinter Beaver Creek flows at the confluence of Fossil Creek ranged between 35 and 80 cfs (data taken from ADF&G, 1987a). This would represent a large and significant groundwater contribution from the White Mountains, well downstream of mining activities. This contribution might

also be extremely significant during periods of unusually low summer flows. These flows contrast with extremely low flows observed during midwinter fishery surveys upstream from the White Mountains (Webb 1982).

Commercial, Sport, and Subsistence Fishing

Arctic grayling is the most abundant species and is most prized by sport anglers. Grayling populations are lightly utilized due to low public use of the area. Most fishing is associated with recreational floating. Increased access would provide more opportunity to catch grayling and possibly other species.

There was a commercial fishery for whitefish during the 1950's and 1960's in the vicinity of Herman's Landing (Winter pers. comm. 1987). Hundreds of fish were netted in open water in the spring of these years by a land owner/trapper at Herman's Landing (Fisheries Map) and sold in Fairbanks area stores. The contribution of Beaver Creek salmon to the Yukon River commercial fishery is not known.

Personal communication (Carufel 1986) with the land owner/trapper at Victoria Creek indicated that chinook and chum salmon were taken below Victoria Creek for subsistence purposes. Other than this, data are not available on subsistence use by people living on Beaver Creek below Victoria Creek.

Efforts have not been made to delineate the economic value of commercial, recreational, and subsistence fish resource use. Possibly some economic value can be determined once the amount of harvest is known and recreation uses of time, equipment investment, and supplies are documented.

Turbidity and Primary Production

Occasional increases in turbidity in the upper 30 miles of Beaver Creek (normally a clear stream) are due primarily to placer mining activities and erosion from disturbed areas on Nome Creek (DOI 1983b). Webb (1982) reported that muddy water discharges into Beaver Creek from mining activities on Nome Creek were visible as far as 50 miles downstream. Placer mining activities in the Bear, Champion, and Ophir Creek drainages may cause seasonal increases in turbidity in these streams and upper Beaver Creek (DOI 1983b). Additionally, however, visually noticeable amounts of suspended sediments due to natural rainfall have been observed on unmined tributaries (Vogler, Durtsche, pers. comm. 1988).

No data are available regarding primary production on Beaver Creek or its tributaries. However, because water quality is expected to be good over much of the stream due to limited mining influence, primary productivity would be expected to be reflective of unmined natural conditions for subarctic Alaskan streams.

Conclusions

The presence of at least nine species of resident fish and perhaps two species of anadromous fish should be considered indicative of good habitat conditions within the mainstem. The presence of fly-in recreational fisheries on this stream is further evidence of a quality fishery (ADF&G 1987a). Support of substantial fish populations is dependent on maintenance of adequate food supplies which are in turn dependent on the primary producers and detrital inputs of the system. The fact that fish populations do exist in the mainstem is evidence that the general condition of the stream regarding productivity and food organisms is good. More data on water quality, primary productivity, aquatic invertebrates, and fish populations would be necessary to quantify the extent and magnitude of mining impacts in this basin.

3.8 Cultural Resources

3.8.1 Prehistory

It is now well accepted that, during the late Wisconsin glaciation, Alaska and Siberia were part of a single continental land mass known as Beringia. Much of the ice-free interior of Alaska at that time consisted of a steppe-tundra environment that supported animals such as bison, horse, and mammoth. This rich fauna also provided a support base for humans. Cultural finds throughout Interior Alaska indicate the presence of humans as early as 11,000 years ago.

Although work undertaken by West (1981) and Will (1986) did not find prehistoric archaeological sites in the Beaver Creek drainage, sites found along the Yukon River, the Porcupine River, Birch Creek, the Livengood vicinity, at Fairbanks, and isolated finds throughout the Tanana-Yukon Uplands indicate potential for discovering cultural resources in the drainage.

Several of the isolated finds were reported by early miners, and it is probable that more material was discovered in the past than was reported. Much of the earlier mining consisted of hand work and hydraulic mining, which are techniques more likely to reveal cultural resources than destroy them, as heavy equipment frequently does. No known sites in the drainage have been identified as eligible for the National Register of Historic Places.

3.8.2 Ethnographic History

Ethnographic literature for the Beaver Creek area is extremely limited. Most of the early reports concern adjacent Birch Creek, which flows very near Beaver Creek in places, and the Yukon River. Osgood (1936) reported in 1932 that the "Birch Creek" or Tennuth Kutchin people occupied the area drained by Birch Creek and much of the Beaver Creek drainage, but he felt that these people had been largely wiped out by epidemic disease soon after their discovery by whites. During the 1860's as much as 80% of the population of the area died during a scarlet fever epidemic (Osgood 1936), and the present inhabitants appear to have their roots in the remnant population (Slaughter n.d.).

Contact with Europeans may have occurred as early as 1845 when John Bell of the Hudson's Bay Company entered the area (Slaughter n.d.). In 1847 Fort Yukon was established as a Hudson's Bay Company trading post. The Russians entered the area by 1863 according to British observations (Sherwood 1965). Not only did the presence of a Hudson's Bay Company post offer new goods and technologies to the Gwich'in, but their lifestyles began to change as well. Firearms, iron tools, beads, and tobacco were the most important trade goods (Slaughter n.d.). The use of furs as a trade item also meant an increase in the importance of furbearers, if not a major shift in the economy (Nelson 1973), and the introduction of dog sleds by the British (Slaughter n.d.) brought an easier way of transportation. The use of dog sleds, and the resultant need for dogs, has been cited as a cause of semi-permanent settlements, as well as a greatly increased use of fish in subsistence (McKennan 1969a, 1969b). After the purchase of Alaska by the United States in 1867, the Hudson's Bay post in Fort Yukon was abandoned, then reoccupied by the Alaska Commercial Company for a few years. The post was again abandoned and reopened during the gold rush of the latter 19th century (Slaughter n.d.).

According to Caulfield and others (1983) current Birch Creek village residents consider themselves the Dendu Gwich'in who traditionally occupied the Yukon Flats region south of the Yukon, and portions of the Crazy and White Mountains.

David James, a Birch Creek village resident and son of Birch Creek Jimmy, told Caulfield that his father had said the original Dendu Gwich'in were "mountain people" who lived principally in the foothills of the White Mountains and utilized primarily caribou and sheep. The Gwit'ee Gwich'in were said to be the band who lived along Birch Creek and their name meant "people living under," perhaps referring to the fact that they lived at the base of the White Mountains. The name Dendu Gwich'in, meaning "people of the other side," was apparently a name assigned to the band by another group and was not traditionally used by the band to describe itself.

Traditional use of the White Mountains area is reflected by the Kutchin place name Luw donaa, meaning "white mountain"; the Dinkjuk vadzaih ttnal, referring to the moose and caribou fence located on the north side of the White Mountains; and accounts of sheep hunting in the Victoria Mountain area before Birch Creek Jimmy's time. These places have not been identified as Native religious or ceremonial sites.

Since early Native people used a variety of resources and traveled extensively, it is not unreasonable to think that groups from Birch Creek, the Yukon, the Minto Flats area, or as far as the Salcha and Tanana Rivers might have traveled and hunted in the Beaver Creek drainage.

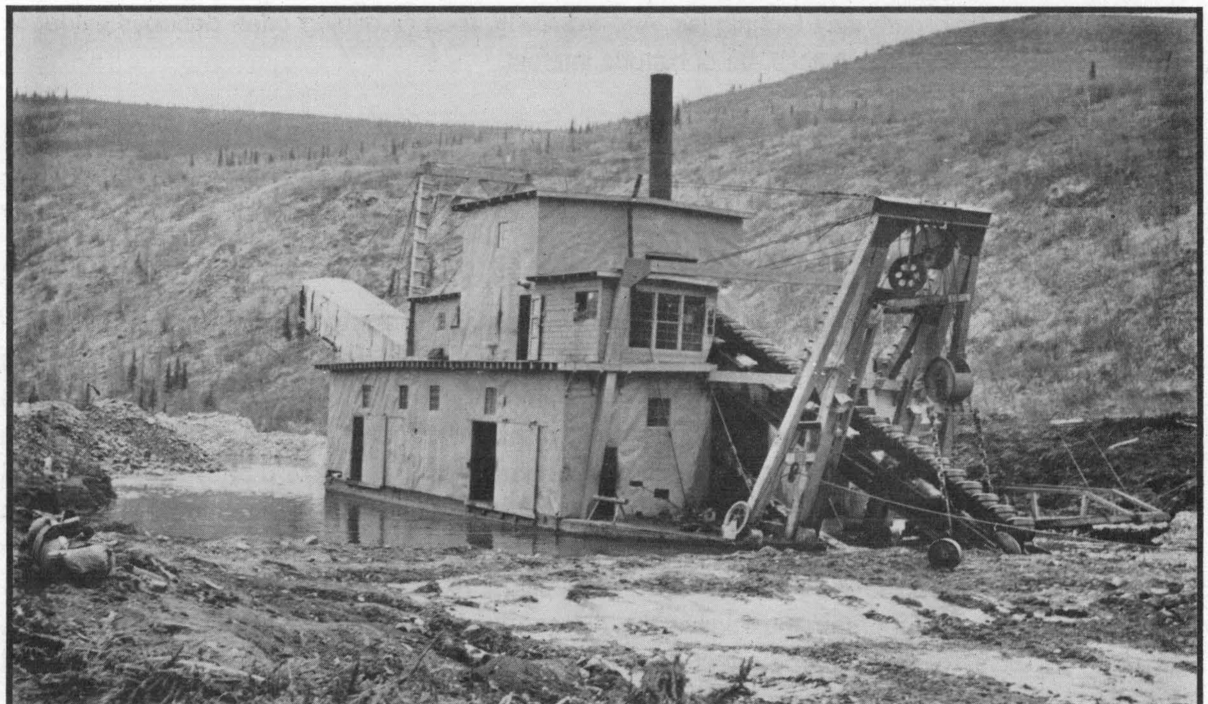
3.8.3 Mining History

Gold has undoubtedly dominated the more recent history of the Beaver Creek area. In 1863, Rev. Robert McDonald reported finding fossils and gold at a site called "Kotlo" located probably somewhere on Preacher or Birch Creek. In 1873 Jack McQuesten (1977) and companions spent the winter at the mouth of Beaver Creek and did some prospecting. The amount of gold they found did not appear to justify further efforts, but by 1900 there were 60 recorded claims in the "Beaver River

Mining District." Brooks (1905) reports the first gold rush to Victoria Creek in 1904; however, it was not until 1910 that any real activity took place. Claims were developed on Trail, Ophir, and Nome Creeks. In 1926 the Nome Creek Dredging Company built and operated a small dredge on Nome Creek. It burned in 1932 and was replaced with a dredge from Deadwood Creek in 1939 which was worked for two years, shut down during the war, and operated again from 1945 to 1947 (Ducker 1983).

Mining activity in the Beaver Creek drainage and Chandalar District encouraged travel, and in 1909-1911 a winter trail and cabins were built along the Chatanika-to-Beaver route by the Alaska Road Commission (Board of Road Commissioners 1912). Shelter cabins were later built along the trail running parallel to Beaver Creek itself. The river ice was rarely used due to warm springs and overflow (Board of Road Commissioners 1931).

Although trapper/prospector cabins, which generally date from the 1930's or later, can still be found throughout the area, most of these are collapsed ruins with few associated artifacts. Prior to helicopter access, undisturbed cabins with artifacts undoubtedly existed, but most of these have been impacted. There is little other evidence of early activity. The remains of the dredge on Nome Creek are scattered along the valley amidst the dredge tailings.



Typical placer mining dredge, located on Jack Wade Creek, circa 1920's. Photo courtesy of the Anchorage Museum of History and Art.

3.8.4 Paleontology

The Beaver Creek drainage undoubtedly has potential for paleontological material. McDonald's 1863 report of fossils, bones eroding from bluffs near Victoria Creek (Will 1986), and much older material such as early Silurian brachiopods and Late Ordovician megafossils (USGS 1987a) from the lime-

stone outcrops of the White Mountains, are all indications of the area's potential. Little has been done with this resource, largely because of the remoteness of the area. Past mining and prospecting may have had some impact on discovery and recovery of paleontological material, but the lack of extensive activity along Beaver Creek where most of the Quaternary alluvium exists, probably resulted in little significant impact. Little systematic work has been done in the higher areas around the limestone outcrops. The dredge activity along Nome Creek may well have had a detrimental impact on paleontological resources in that valley.

3.8.5 Discussion

The existing knowledge of prehistory in Interior Alaska is limited. The remoteness of the country and relatively few sites, combined with dense vegetation and permafrost, make cultural resources generally difficult to find.

There is a curious relationship between mining and cultural resources. On one hand, mining has promoted understanding of the past because of artifacts collected from sluiceboxes, fossils exposed during hydraulic stripping, and site locations identified during exploration or prospecting. On the other hand, mining operations often destroy cultural material. Current mining practices are much more destructive than early-day techniques. And ironically, today's mining often destroys evidence of earlier mining which may, in itself, be of historic interest.

Most mining today takes place on previously disturbed ground. This trend is likely to continue for some time with the development of improved gold recovery techniques. Most of the damage to cultural and paleontological resources has probably already taken place in the drainages currently available for mining.

There are conflicts between Section 106 of the National Historic Preservation Act and the CFR. Section 106 requires that BLM identify all cultural resources that may be eligible for nomination to the National Register of Historic Places and allow for comment by the State Historic Preservation Office (SHPO) (15 days) and Advisory Council of Historic Preservation (ACHP) (30 days) prior to allowing activity that may impact such sites (36 CFR 800). In contrast, 43 CFR 3809.1-6(5)(c) states that BLM or the operator shall have 30 days to complete an appropriate cultural resources inventory prior to approval of a Plan of Operations. Cultural resources are not covered under Notices other than under "undue or unnecessary degradation." Should cultural resources be discovered during operation under a Plan, the operator must leave the discovery intact and notify the Authorized Officer, who has 10 days to remove or protect the resource before allowing the operator to proceed [43 CFR 3809.2-2(e)].

It is physically and economically impossible to locate and recover all cultural and paleontological resources prior to surface disturbing activity. However, if they were left permanently protected in the ground, we would have virtually no knowledge of prehistory in Alaska. Since locating these resources in river valleys is rare, frequent monitoring of mining operations and good working relationships with the operators have proven more effective in identification and recovery of inadvertently dis-

covered cultural and paleontological materials. Education, crediting the discoverer, and making research or analysis results available to the public help protect and mitigate any adverse affects to such resources.

3.9 Subsistence

3.9.1 Introduction

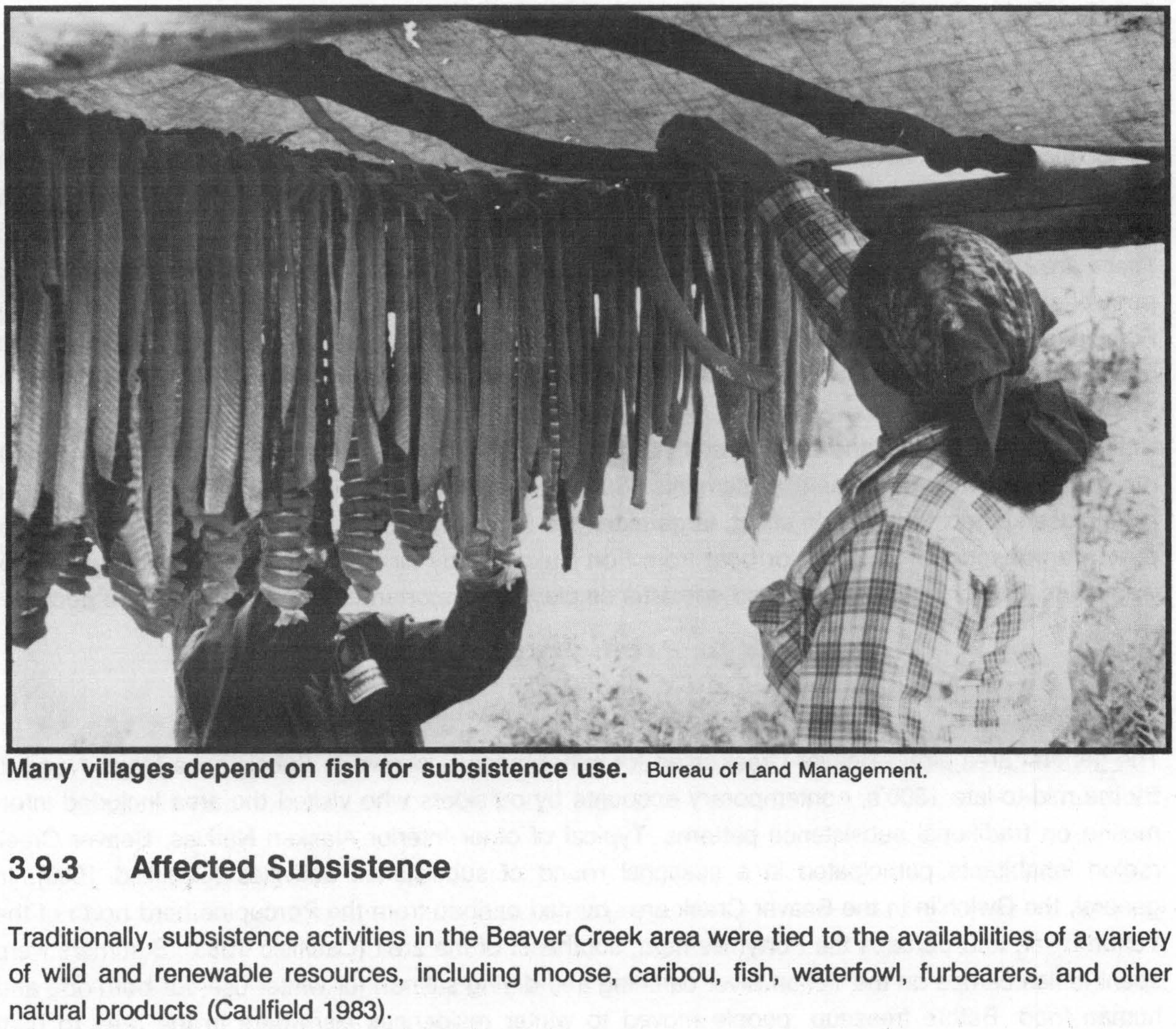
The lower Beaver Creek drainage is used for subsistence by people from Birch Creek Village, Beaver, and Fort Yukon (Caulfield 1983). People from all three villages had traditional place names for locations along Beaver Creek (Caulfield and others 1983, and Section 3.8.2). The Alaska Department of Fish and Game (ADF&G 1986c) has compiled statistics on socioeconomic profiles of Alaska communities. Birch Creek Village had a population of 31 in 1984 and 97% were Native Alaskan. There are no data on cash income or amount of subsistence use per capita. Fort Yukon had a population of 665 (71% Native) and Beaver 65 (99% Native). Per capita taxable income in 1982 in Fort Yukon was $14,152 and in Beaver, $7,856; the state average was $21,127. Per capita harvests of all subsistence foods are estimated at 862 pounds in Beaver and 707 pounds in Fort Yukon.

Until the 1950's, Beaver and Birch Creek villages were used only as seasonal bases (Shimkin 1955), but today both are permanent settlements (Sumida and Alexander 1985). People in both villages have close kin relationships, in effect, large extended families (Caulfield 1983, Schneider 1976). Supplies are transported by barge or boat from Fort Yukon or by air from Fairbanks. Opportunities for wages are limited in the villages, and subsistence plays an important role in the lives of the people.

3.9.2 Subsistence Uses

The general area along Beaver Creek used for subsistence is shown in Subsistence Maps 1 and 2. By the mid-to-late 1800's, contemporary accounts by outsiders who visited the area included information on traditional subsistence patterns. Typical of other Interior Alaskan Natives, Beaver Creek region inhabitants participated in a seasonal round of subsistence activities (Caulfield 1983). In general, the Gwich'in in the Beaver Creek area hunted caribou from the Porcupine herd north of the Yukon River, and perhaps the Fortymile herd, southeast of the area (Caulfield 1983). Summers were spent in fish camps on the Yukon River catching and drying salmon for winter use, for both dog and human food. Before freezeup, people moved to winter residences elsewhere in the area to hunt moose and waterfowl, and also to fish for whitefish. After freezeup, traps were set, and much of the winter was spent harvesting furbearers and preparing furs for trade. In the spring, after breakup, fish traps were set, and muskrats were hunted in the lakes and sloughs. By the mid-19th century, trapping achieved new importance in the subsistence round because of demand for furs throughout the world. Traditional trapping to supply localized needs shifted increasingly to a situation where furs went to white traders for values linked to the fluctuating world markets. Thus, the overall subsistence and trading economies of the Gwich'in changed (Caulfield 1983).

Further, when gold was discovered in the Upper Yukon drainage, as early as 1863 on Preacher Creek, the influx of whites, particularly in the 1880's and 1890's, brought the Beaver Creek area even more under the influences of non-local events. Yet despite the changes that ensued, the importance of subsistence activities, both economically and culturally, remain. Today, subsistence activities remain important to area village inhabitants. Also, some harvest of Beaver Creek drainage wild and renewable resources occurs around the confluence of Beaver and Victoria Creeks by a resident family. (DOI 1984).



Many villages depend on fish for subsistence use. Bureau of Land Management.

3.9.3 Affected Subsistence

Traditionally, subsistence activities in the Beaver Creek area were tied to the availabilities of a variety of wild and renewable resources, including moose, caribou, fish, waterfowl, furbearers, and other natural products (Caulfield 1983).

Moose

Moose are an important subsistence specie, not only for the amount of meat they produce, but also for hides and other uses. Meat is usually distributed among all the villagers, and has cultural significance as a traditional food for funeral and memorial potlatches (Sumida and Alexander 1985, Olson 1981, Osgood 1936). By 1955, moose provided up to 50% of all meat and fish consumption by weight (Shimkin 1955).

Moose hunting is regulated throughout the state by the Alaska Department of Fish and Game; the Beaver Creek area is in Game Management Unit 25(d) West. Only subsistence hunting has been allowed in this unit since 1983-1984 (Sumida and Alexander 1985). By 1986-1987, total moose harvest was limited to no more than 35 bulls, allowed to taken only by eligible hunters from Birch Creek village, Beaver village, and Stevens Village (Nowlin, pers. comm. 1988). Reports show Birch Creek hunters harvested two moose in 1983-84 and three in 1984-85; hunters from Beaver harvested seven moose in 1983-84 and 12 in 1984-85. Typically, three periods of hunting are allowed: September 10-30, December 1-10, and February 18-28 (Sumida and Alexander 1985).

Moose habitat requirements are discussed in the wildlife section of this chapter. The ADEC study (1986) suggests that moose and other wildlife are affected by mining only in the actual mined area, which does not include the subsistence use areas on Beaver Creek. The moose populations hunted there are distinct from those in the upstream mined areas. Nevertheless, the moose habitat in the hunting unit is degraded, for reasons not clear (DOI 1987c), with total moose numbers in the area relatively low.

Caribou

Caribou have been important to the people in the Beaver Creek area, although recent use has declined with the movement of caribou migration away from the immediate vicinity (Caulfield 1983). Historically, residents of Beaver, Fort Yukon, and the Birch Creek village area traveled up the Yukon River to the Charley River to obtain caribou (Schneider 1976). Shimkin (1955) states that caribou had become rare on Yukon Flats by the mid-1950's, but Fort Yukon residents harvested 300 animals on the Porcupine River in 1957 (USFWS 1964). Birch Creek Village residents report that after 1940 few caribou were available near the village (Caulfield 1983), although isolated animals are taken by trappers in the White Mountains. Thus, caribou are hunted when they are available, but are not consistently a part of the subsistence pattern of the area.

Fish

Fishing occurs in the Beaver Creek drainage, the Yukon River, and in the lakes and sloughs in the area (See Subsistence Map 2). Salmon fishing occurs during the summer in fish camps along the Yukon. Three species of salmon are present and harvested (ADF&G 1987a), but residents indicate that the salmon harvest has declined in recent years. The ADEC's report (1986) quotes a resident of Birch Creek village who usually caught up to 400 salmon (dates not stated, however) having a catch of 10-20 salmon in 1985. The Yukon River salmon fishery is probably more affected by commercial fishing of migrating salmon before they enter the river system, and perhaps by downstream catchment than it is by the possible effects of mining (ADF&G 1986a, DOI 1987c).

However, other fish are harvested from Beaver Creek and the sloughs and lakes near the village. Whitefish, pike, suckers, and sheefish are harvested in these areas using nets, some of which are set under the ice. Grayling are most often caught with a hook and line. There is some evidence (ADEC 1986, ADF&G 1987b) that there is a possible downward trend in the populations of these fish because of degradation of their environment due to increased sedimentation and turbidity from mining or non-point sources. However, data for Beaver Creek are incomplete, and effects of upstream

mines on the fishery remain to be studied (ADF&G 1987b). Currently, in 1987, the lower portion of Beaver Creek where village-based subsistence fishing occurs is not significantly impacted. The ADF&G report (1987b) concludes, "Cumulative effects of mining on the fishery resources of the Beaver Creek system appear to [be] minor."

Waterfowl

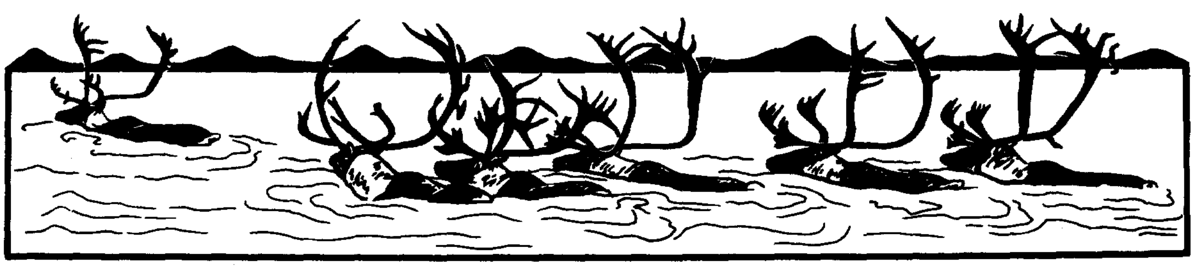
Waterfowl hunting traditionally provides the first fresh meat in the spring (Caulfield 1983), but bird hunting today is seasonally regulated by the ADF&G. The most important areas for waterfowl subsistence hunting (See Subsistence, Map 2) are in the lakes and sloughs downstream toward the Yukon River, and between Beaver and Birch Creeks (Caulfield 1983). Geese, ducks, and cranes are all present in the area, arriving in the spring and migrating south in the fall.

The residents of the village report a general decline in waterfowl populations over the past few years (ADEC 1986, Birch Creek Villagers 1987), resulting in serious effects upon subsistence use. The causes for the population decline are not clear to the villagers; however, they are not related to mining in the headwaters of Beaver Creek.

Furbearers

Traplines are generally located in the downstream Beaver Creek drainage (See Subsistence Map 1). Trappers from Birch Creek Village, Beaver, and Fort Yukon use the area (ADEC 1986). Time and effort spent on trapping depends largely upon fur prices (Caulfield 1983), but some animals such as muskrat are used for food, and some such as wolf have traditional cultural value as well (Osgood 1936). Other factors in subsistence trapping include environmental conditions, condition of the furbearer populations, and other sociocultural factors.

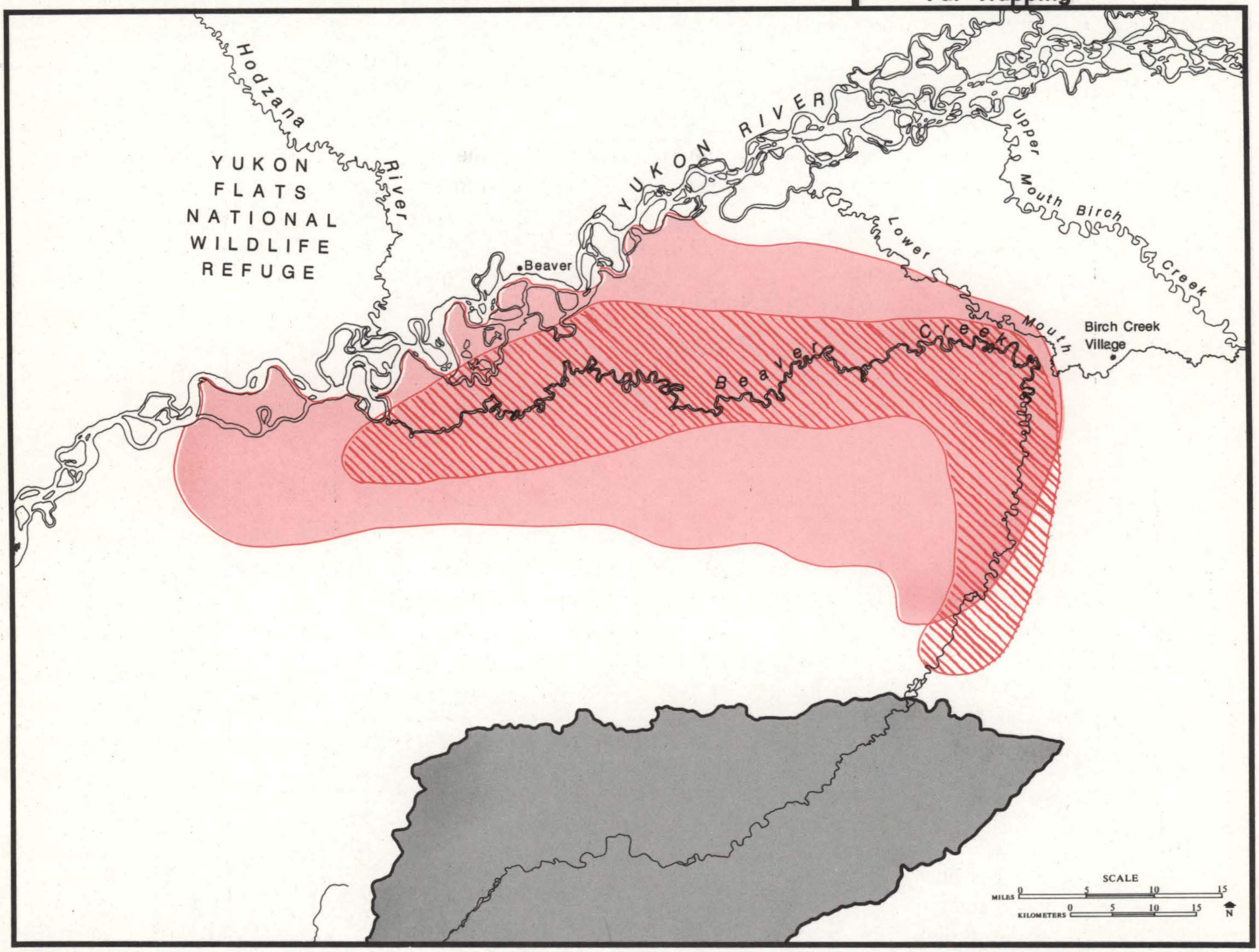
A variety of species are trapped, with marten as the most abundant and economically important species (ADEC 1986). Beaver are limited to 25 per trapper by Alaska game regulations, although they are relatively abundant in the area. Lynx and wolf are also trapped (ADEC 1986). Muskrat, both trapped and hunted, are used for both fur and food (Caulfield 1983). Residents report a decline in the overall muskrat population and attribute it to sedimentation of stream banks (ADEC 1986). However, this condition is not notable in the lower Beaver Creek area.



Caribou

Subsistence

Subsistence Uses within Beaver Creek Drainage:
Moose Hunting
Fur Trapping



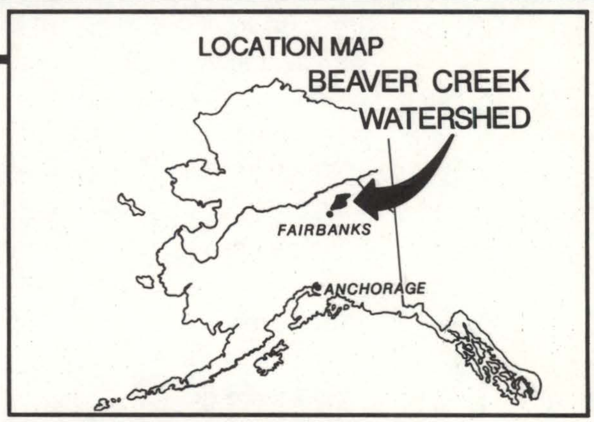
Legend

Moose hunting area*

Fur Trapping area*

Northern area of Beaver Creek watershed

*Data derived from Sumida and Alexander (1985), Caulfield(1983) and Slaughter(n.d.) for villages of Birch Creek, Beaver, and Fort Yukon.



Note: Subsistence use areas depicted are based on information obtained from a sample of community households; subsistence patterns of household resource use may change from year to year while information is collected for specific periods. Therefore, all maps can be considered potentially only a partial representation of areas important to local village residents. This map represents only the subsistence use of the lower Beaver Creek drainage; it is not intended to depict total subsistence use areas for any of the villages.

Beaver Creek

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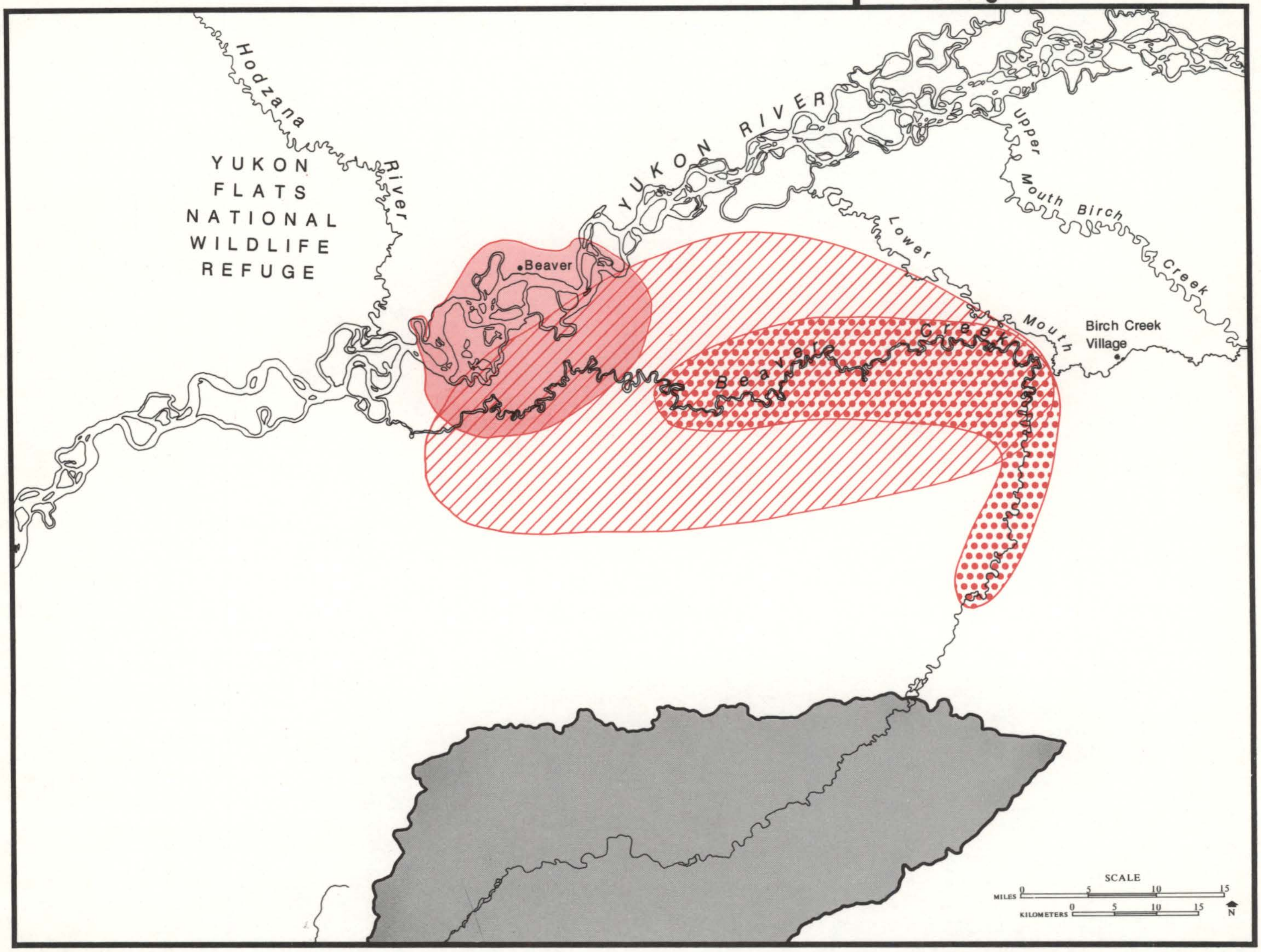
Subsistence 2 of 2

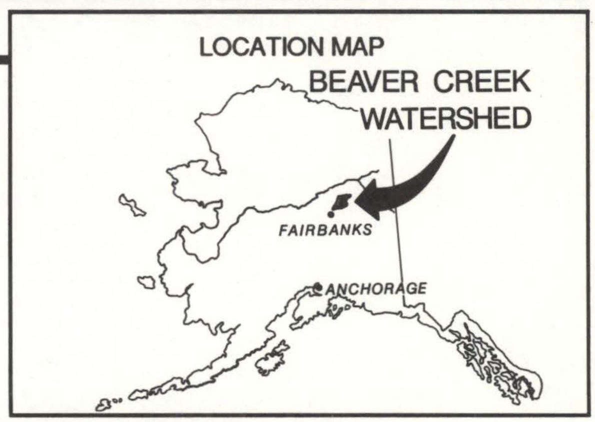
Subsistence Uses within Beaver Creek Drainage: Waterfowl Hunting Fishing



Legend

- Salmon fishing area*
- Other fish species fishing area*
- Waterfowl hunting area*
- Northern area of Beaver Creek watershed

*Data derived from Sumida and Alexander (1985), Caulfield(1983) and Slaughter(n.d.) for villages of Birch Creek, Beaver, and Fort Yukon.



Note: Subsistence use areas depicted are based on information obtained from a sample of community households; subsistence patterns of household resource use may change from year to year while information is collected for specific periods. Therefore, all maps can be considered potentially only a partial representation of areas important to local village residents. This map represents only the subsistence use of the lower Beaver Creek drainage; it is not intended to depict total subsistence use areas for any of the villages.

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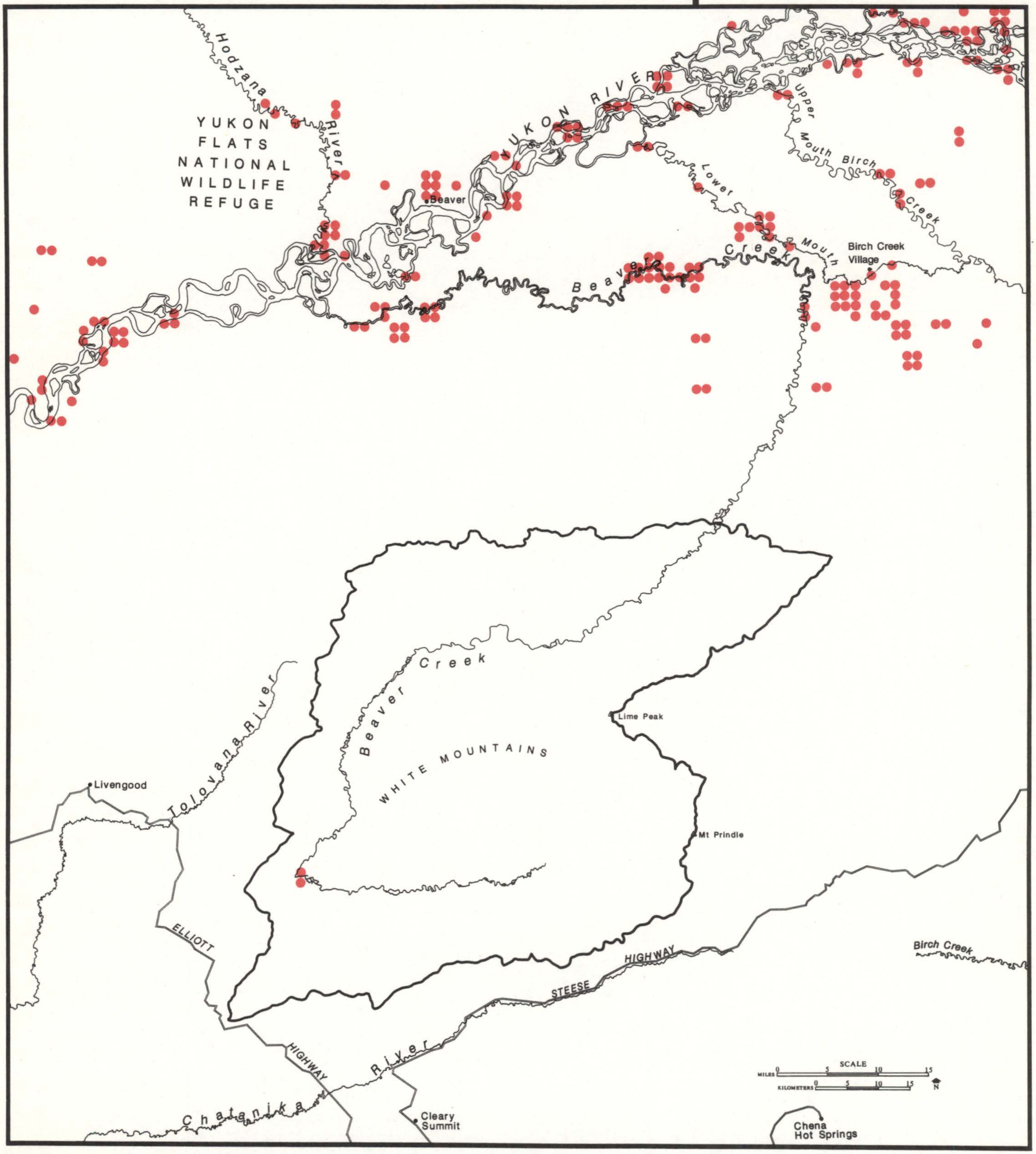
Native Allotments



Sites of Native allotments. Each dot may represent more than one allotment.

Other Resources

Other resources utilized in the subsistence system of Beaver Creek are plant foods, small game, and trees. Blueberries, cranberries, and other edible plants are available and harvested locally near the villages in the flats areas. Trees are utilized for heating or building; they are cut upstream and floated down to the village. Snowshoe hares, grouse, and ptarmigan are obtained near the village (Caulfield 1983). There is no indication from the villagers that these resources are declining for any reason.

Native Allotments

Native allotments have been provided for by legislation dating back to 1906; those along Beaver Creek are shown in the Native Allotments Map (DOI 1987d). These allotments are used to maintain traplines, for hunting camps, and for other subsistence activities. In general, their locations indicate areas of importance for local subsistence users today.

Conclusions

Subsistence activities continue in the Beaver Creek drainage, where they remain economically and culturally important to area residents. Traditional patterns of usage, although technologically changed by modern equipment, continue but are shaped today by game management practices and regulations, as well as natural fluctuations in animal populations, water levels, precipitation, climate, and other factors. Presently, mining in the upper reaches of Beaver Creek does not appear to have any significant effect on subsistence uses, users, or resources in downstream areas utilized by Birch Creek villagers and other area inhabitants. As the water resources section states, Beaver Creek has generally good water quality. Consequently, subsistence activities remain viable.

3.10 Recreation and Visual Resources

3.10.1 Recreation

Management Framework

The principal legislation and planning documents guiding recreation management of the affected area are referenced in Section 1.6.

Both the 1986 Resource Management Plan (RMP) and the 1988 Recreation Activity Management Plan (RAMP) for the White Mountains NRA were designed to accommodate a variety of public recreation needs, identified through extensive public involvement in the planning process. These range from non-motorized activities in a wild setting nearly free of improvements, to motorized activities in an environment which is still predominantly natural, but which contains some improvements both for visitor convenience and safety, and for resource protection. To provide for this variety of activities and to minimize conflicts between the various types of users, the NRA was

divided into four management units, each managed to facilitate a different mix of recreation opportunities, which vary seasonally. These management units are shown on the Recreation Map, which was adapted from the White Mountains NRA RMP and RAMP.

The Highlands Unit, encompassing the spine of the White Mountains and surrounding high country, is managed in summer for hiking and horseback use in an essentially wild setting, and is closed to off-road vehicle (ORV) use. In winter the unit is open to snow machines. (For management of ORV use, "summer" has been defined as the period from May 1 through October 14; winter is the remaining period from October 15 through April 30.)

The Foothills Unit is managed for a wide range of summer recreation activities in combination with other resource uses. Most existing and planned recreation facility developments are within this unit. It is managed in summer for camping, ORV touring, recreational gold panning, and other traditionally vehicle-based activities, and to provide staging areas for activities in the Highlands and Wild River Corridor management units. In winter it is managed for snow machining, dog mushing, and cross-country skiing. The use of ORVs of less than 1,500 pounds GVW is unrestricted year-round, except that the White Mountains Summer Trail is closed to motorized use.

Research Natural Areas are established as typical representatives of a type of ecosystem, or because they contain unusual natural features of scientific interest. There are three Research Natural Areas within the White Mountains NRA: Serpentine Slide, Limestone Jags, and Mount Prindle. Management emphasis is on allowing natural processes to continue undisturbed. Hiking, hunting, and nature study are examples of recreation activities recognized as being compatible with the unit's primary purpose of providing an undisturbed location for scientific research on the natural environment. The units are closed to ORV use year-round.

The Wild River Corridor Management Unit encompasses the legal boundaries of the Beaver Creek NWR. It is managed according to the 1983 River Management Plan for summertime uses of nonmotorized boating and hiking, and associated camping, fishing, and sightseeing in a primitive setting. The unit is closed to all ORV use in summer, but in winter is open to snow machine use.

Recreation Facilities

Existing recreation developments consist of five public use cabins and 115 miles of maintained trails, as depicted on the Recreation Map. Although other trails constructed primarily as mining access routes also receive recreation use, the trails shown on the Recreation Map are maintained by BLM with the specific objective of providing recreation opportunities. The majority of the recreation trail system is managed for winter travel, and conditions permitting, BLM employees pack the trails after each snowfall. Most trails are not designed for summer use, because they extend through low-lying areas where the soils are typically saturated. An exception is the White Mountains Summer Trail, which follows high ground and is managed for non- motorized uses. The public use cabins are located at intervals along the trail system and are available by reservation for $15 per night, with a maximum stay of three nights. There are no established campgrounds within the White Mountains NRA, but the nearby campground on the Steese Highway at Cripple Creek serves as a base for many recreation users of the area.

Beaver Creek

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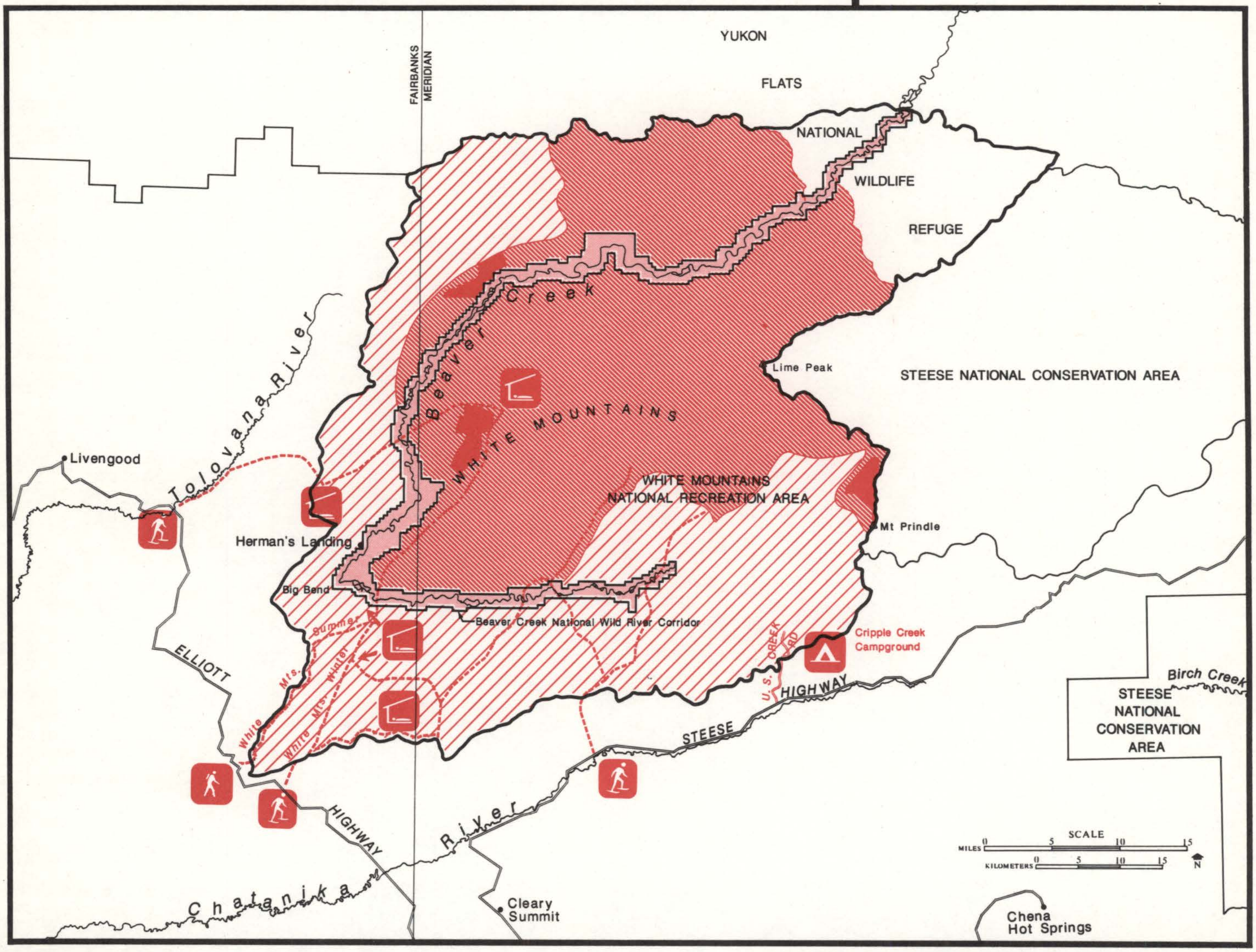
Recreation



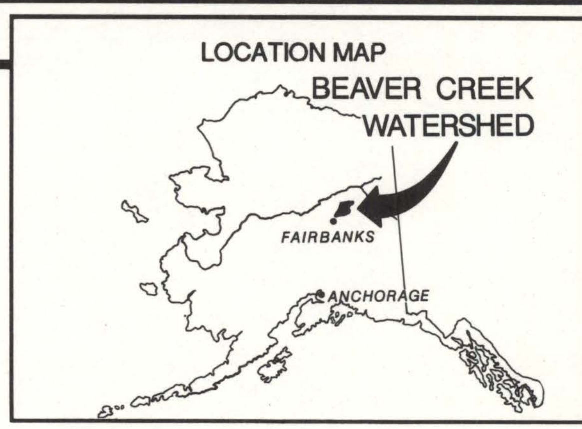
Legend

Management Units

- Highlands
- Foothills
- Research Natural Area
- Wild River Corridor

Existing Recreation Facilities

- Public Use Cabin
- Winter Trailhead
- Summer Trailhead
- BLM Campground
- Trail



Over the past several years BLM has spent nearly $300,000 upgrading and constructing new recreation facilities such as the above-mentioned cabins and trails. Additional recreational developments are proposed, including trailhead facilities, trails, pubic use cabins, and trail shelters. The Nome Creek road is to be improved to facilitate public access to Beaver Creek. Only existing facilities are shown on the Recreation Map which accompanies this section. Detailed descriptions and the locations of planned facilities are presented in the 1988 RAMP for the White Mountains NRA (DOI 1988a).

Summer Recreation Use

Summer recreation use in the White Mountain NRA is generally light, due to poor access. The only road access into the interior of the NRA is from the Steese Highway via the U.S. Creek Road to Nome Creek, the usual put-in point for floating Beaver Creek.

Boating

The National Wild River receives rafting, canoeing, and kayaking use. Most boating parties spend one to two difficult days paddling and pulling their boats over the shallow riffles of Nome Creek before reaching leisurely floating on Beaver Creek at river mile six. Parties then travel an average of 10 to 15 river miles per day, requiring 7 to 10 days to float the National Wild River portion of Beaver Creek. Besides the primary activity of floatboating, Beaver Creek NWR visitors engage in nature observation, hiking, hunting, and fishing. The fish species of most interest to anglers is arctic grayling, followed by northern pike, sheefish, and whitefish. Because there is no road access to any point on the Wild River, the only take-out is to arrange a pick up by float plane or wheeled aircraft, usually in the vicinity of Victoria Creek near the northern boundary of the White Mountains NRA, or by continuing an additional 8 to 14 days (268 river miles) down the Yukon River to the Dalton Highway. Because of time constraints, very few parties complete this longer trip.

Tracks indicate wheel-plane access is occurring on gravel bars within the river corridor. In addition to river float trips, such use is associated with fly-in sport hunting and fishing.

Other Summer Activities

In addition to providing access for float trips on the Beaver Creek NWR, the U.S. Creek Road is used by recreationists pursuing gold panning, ORV trail riding, sport hunting (which may also involve the use of ORVs), dispersed site camping, and hiking the Mount Prindle area. Most hiking, however, is concentrated on the White Mountain Summer Trail, accessible from the Elliott Highway. ORV-based hunting occurs primarily along Bear, Champion, and Nome Creeks.

Winter Recreation Use

The principal recreation attraction in the White Mountains NRA is the system of trails and cabins, and winter, with its vastly improved access, in the principal use season. Winter cabin reservations have increased ten-fold in the five fiscal years from 1984 through 1988, because of high visitor demand and the recent construction of additional cabins and trails. Cabin reservation data indicate

that approximately 66% of winter visitors access the cabins using snow machines, followed by 16% by dog sled, 11% on cross-country skis, and 6.5% "other," such as snow shoes. Besides the maintained trail system, Nome Creek is another popular area for these winter recreation activities.

Figure 3.4 provides visitor use statistics for the White Mountain NRA and Beaver Creek NWR.

Activity	1984 Visits	1987 Visits	1987 Visitor Use Days
ORV Travel - snowmobile	5,500	6,750	4,500
Winter Sports - skiing/dogs	2,000	3,000	2,000
Non-motorized	250	350	500
Camping	1,000	1,500	1,300
Hunting	5,000	6,500	3,600
Site Based	5,000	7,000	3,800
Fishing	300	300	100
Boating	100	100	2,400
Totals	19,150	25,450	18,200

Figure 3-4. Visits, and 1987 visitor days for the White Mountain NRA and Beaver Creek. These statistics are from Recreation Management Area reports which include recreation sites adjacent to the NRA boundary. Source RMIS - Recreation Management Information System 1984, 1986, 1987 - no reports in 1985.

Effect of Placer Mining on Recreation

Previous placer mining in the Beaver Creek drainage has affected recreation use in ways which are both positive and negative. Many of the trails used by recreationists for both motorized and non-motorized activities were originally developed as mine access routes. Historic and ongoing mining operations also are of interest to some recreation visitors. Mining has thus helped to provide the recreation opportunities which now exist in the White Mountains NRA.

In contrast, mining has also had negative effects for recreationists seeking a primitive recreation experience in a natural environment, particularly in summer, when the effects of mining are more visible. The very little mining or associated surface disturbance that has occurred in the areas specifically managed for primitive recreation (the Highlands and Wild River Corridor management units) took place prior to NRA designation in 1980. Consequently, negative impacts to primitive recreation within the Highlands and Wild River Corridor management units are generally caused by views of active mining operations and previously-worked sites in the adjacent Foothills management unit. With active mines, impacts also result from being able to hear the equipment, or see the effects on water quality.

Water Quality and Recreation

A source of dissatisfaction most frequently cited by recreationists, principally floatboaters, is cloudy water in the upper reaches of the drainage. These conditions have been particularly reported on Nome Creek, where most boating parties put in for trips down the Beaver Creek NWR. Besides being aesthetically displeasing, cloudy water makes it difficult to see and negotiate around gravel bars and other obstacles in the stream channel. The degree and frequency of noticeably turbid stream flow has varied according to the extent of mining activity, fluctuations in water levels, and perhaps other factors. A canoeist reported that during a trip in 1980, Nome Creek was opaque with silt, but was running almost clear during a recent trip on June 5, 1988 (Allen 1988). Noticeable turbidity as a result of placer mining has been documented as far as 50 miles downstream from mining operations (Webb 1982), or river mile 30 of Beaver Creek NWR (DOI 1983b).

Although boaters indicate that cloudy water is a disappointment that reduces the quality of their trip, there have been no reductions in boating use noticed during or after periods of heaviest mining activity. However, BLM does not maintain a float trip registration system, and boating use statistics are based solely on rough estimates. Water turbidity probably does not reduce visitation because cloudy water only occurs at the beginning of an extended boating trip. Figure 3.4 shows that boating and fishing use is estimated to have remained stable since 1984, while participation in other activities has increased. However, this discrepancy probably results from BLM's recent construction of trails and cabins intended to accommodate these other activities. During the same period, no improvements have been made to directly facilitate boating use of the NWR.

3.10.2 Visual Resources

The White Mountains and Beaver Creek are the principal landforms within the White Mountains NRA. The natural landscape's most visually striking element is the contrast of dark vegetation against sheer white limestone cliffs and peaks. Such views form an almost continuous backdrop for floatboaters on Beaver Creek NWR. The scenic quality of the existing landscape is an important part of most recreational experiences in the White Mountains NRA. Maintaining the viewshed along the Beaver Creek NWR, including the background view of the White Mountain ridgeline, is essential to complying with the Wild River designation and the designation of the White Mountains as a National Recreation Area. However, valid existing rights and future rights granted under appropriate federal and State law must also be protected.

The Visual Resource Management System

The BLM utilizes a visual resource management (VRM) system to classify landscapes according to their visual characteristics of form, line, color, and texture, and to describe the degree to which human activities may be allowed to alter the natural landscape. This latter task is accomplished by assigning areas to VRM Classes, which provide standardized objectives for management of the visual resource. VRM classes are assigned primarily in consideration of the overall management objectives for an area, as defined by law and applicable planning documents. Additional factors con-

sidered are an area's existing scenic quality or visual appeal, the degree of public concern for that area's scenic quality, and area's relative visibility from frequently used travel routes or observation points.

Visual quality objectives are summarized below for those VRM Classes applicable to the Beaver Creek drainage:

Class I - This classification is intended to preserve a natural- appearing landscape essentially unaltered by humans. This class does not preclude very limited management activity; however, the level of change to the characteristic landscape should be very low and must not attract attention.

Class II - The objective of this class is to retain the existing natural character of the landscape. Human alterations to the natural environment may be seen, but should not attract attention. The overall level of change to the natural landscape should be low.

Class III - The objective of Class III is to partially retain the natural landscape. Human alterations to the landscape may attract attention, but should not dominate the view of the casual observer. The overall level of change can be moderate, although still subordinate to the natural landscape.

VRM Classes in the Beaver Creek Drainage

VRM classes for the Beaver Creek drainage were developed as part of the White Mountains NRA RMP. The Beaver Creek NWR and Research Natural Area management units are managed as VRM Class I areas.

The Highlands management unit, and the Beaver Creek NWR critical viewshed extending beyond the legal boundaries of the NWR, are managed as VRM Class II. The critical viewshed consists of areas identified as critical to scenic viewing opportunities associated with the Wild River floating experience. Factors considered when determining the critical viewshed include the seen area, viewing angle, viewing time, and topographic screening.

The Foothills management unit is managed as VRM Class III, with the exception of the White Mountain Trail, and those areas determined to be within the NWR critical viewshed, which are managed by Class II objectives.

Mining and the VRM Classes

No mining has occurred within the Beaver Creek NWR critical viewshed. However, placer mining has previously taken place in a VRM Class III area in the Nome Creek drainage, where it is highly noticeable. Observer position, sensitivity levels, and dominance factors all draw the eye to the sites previously disturbed by mining and associated activities. This area has generally reached the maximum level of disturbance which can be tolerated and still retain the degree of naturalness required for VRM Class III. Within other areas of the White Mountains NRA, current conditions in the three VRM classes meet the visual quality objectives for the respective class.

3.11 Economics

Regional Overview

"The Alaska placer mining industry expended an estimated $75 million for labor, goods and services in 1985. Of these expenditures, approximately $64 million were made in Alaska. The industry was estimated to have directly employed 2,200 people on at least a part time basis. When calculated on a 12-month basis, the direct industry employment is the equivalent of over 800 full-time jobs. An equal number of jobs was estimated to be created in the state's support and service industries for a total employment of over 1,600 jobs in Alaska. The indirect jobs created in other states was not estimated. (Peterson 1986)

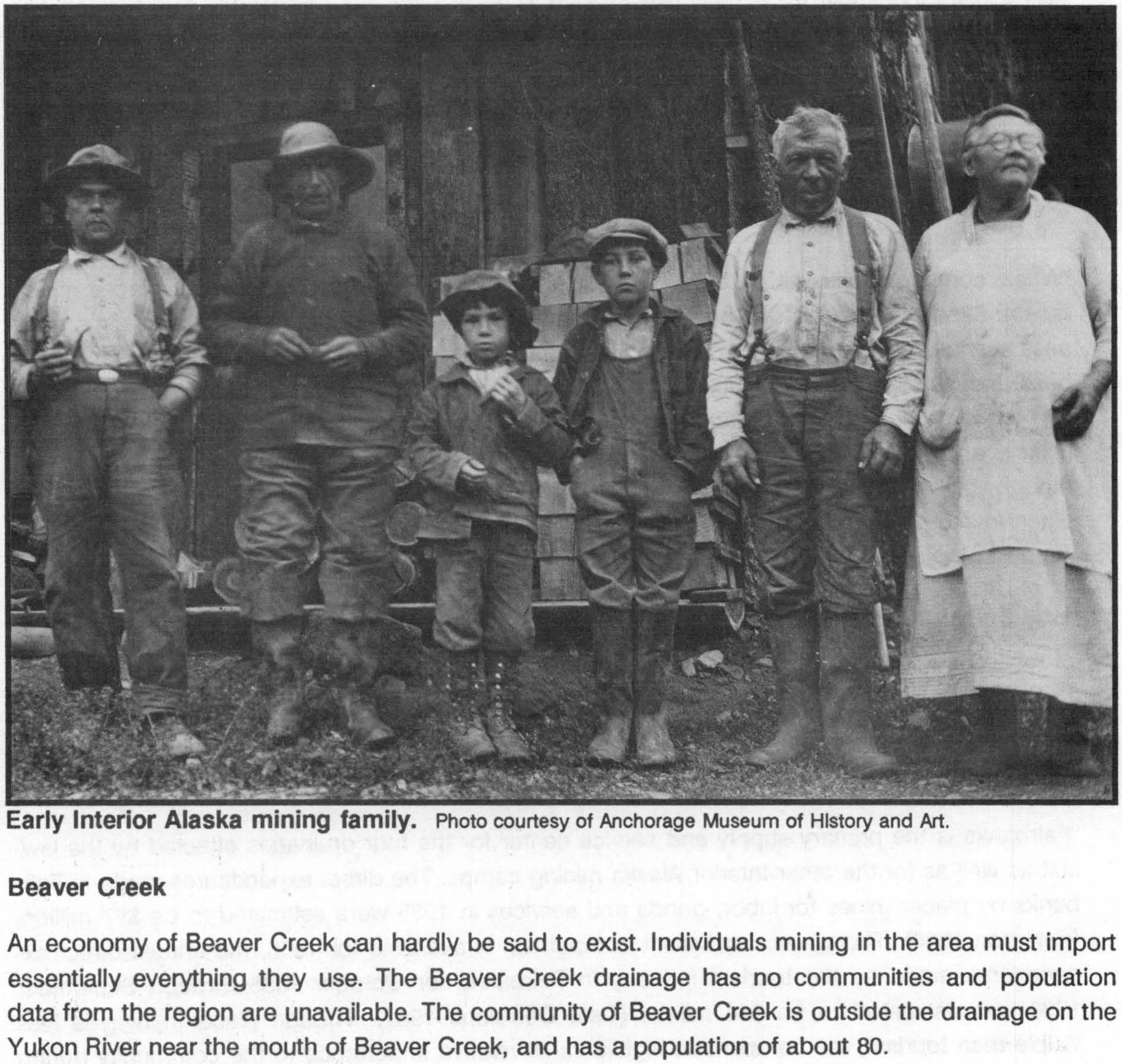
"Of particular note, 34 percent of direct placer mining employment by person-years was for residents of rural Alaska. Residents of Fairbanks accounted for 31 percent of the employment, while Anchorage and states outside Alaska accounted for 16 percent and 19 percent respectively. (Peterson 1986)

"When compared with all industries in the state including support industries, placer mining ranked 52nd in terms of total payroll. The support industries, which would include stores, business services, doctors, gas stations, etc. are defined as industries which are dependent on the basic industries. Basic industries in Alaska are considered to be those that bring new money into the state such as the oil and gas, tourism, fishing, forestry and mining industries. Federal military and government spending are also included as they too bring new money into Alaska though they are not traditionally referred to as industries. When federal spending is excluded, placer mining ranks fifth behind oil, seafood, tourism and gas in terms of the gross value of the state's basis industries. (Todd and Weddleton 1986)

"Placer gold production in 1985 was estimated to be 188,500 refined ounces. Placer production of refined gold in 1986 and 1987 was estimated to be 155,500 oz and 223,300 oz respectively. The number of placer mines in Alaska dropped from 296 in 1983 to 192 in 1986. In 1987, 199 placer mines were operational. The dramatic increase in gold production in 1987 is due to the expanded operations of several of the states largest mines. (Bundtzen 1983-1987)

"Fairbanks is the primary supply and service center for the four drainages effected by the lawsuit as well as for the other Interior Alaska mining camps. The direct expenditures made in Fairbanks by placer mines for labor, goods and services in 1985 were estimated to be $27 million. (Peterson 1986). Though no equivalent comparison is available for 1985, the annual direct expenditures made by the tourism industry in Fairbanks for October 1985 through September 1986 was estimated to be $44 million (Data Decisions 1987). Though placer mining is less visible than tourism, the comparison highlights its relative importance to the community during those years.

"However, since 1985, two of the Interior mining districts serviced and supplied, by Fairbanks have seen significant drops in activity. In the Kantishna district, 17 placer mines were enjoined from operating in 1986 by a lawsuit against the National Park Service and remained closed in 1987. In the Circle mining district, the number of placer mines declined from 40-50 in the early 1980's to 21 in 1986. Overall, the number of placer mines in the Eastern Interior of Alaska has declined from 180 in 1983 to 81 in 1987. (Bundtzen 1983-1987). The level of expenditures and employment in Fairbanks and rural communities serving Interior mining districts has certainly also declined though no economic surveys have been made since 1985. This has undoubtedly had a significant impact on Fairbanks and neighboring communities." (State of Alaska 1988).

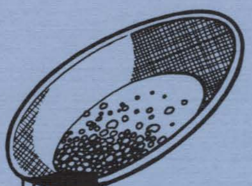


Early Interior Alaska mining family. Photo courtesy of Anchorage Museum of History and Art.

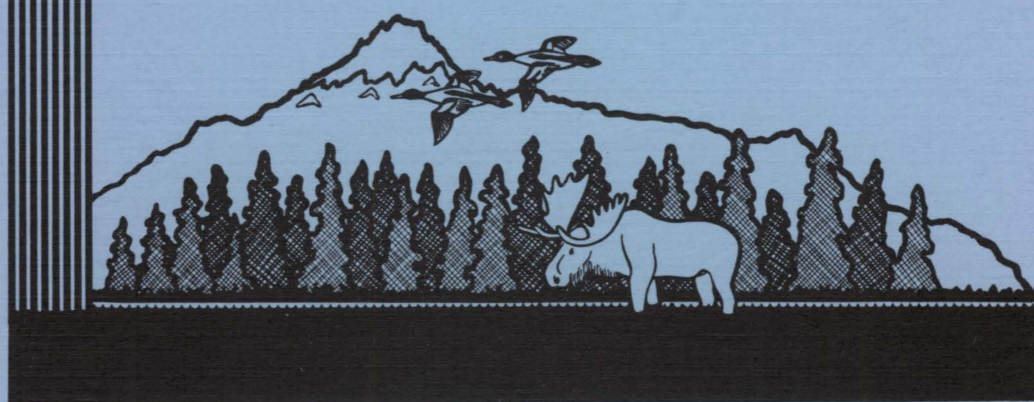
Beaver Creek

An economy of Beaver Creek can hardly be said to exist. Individuals mining in the area must import essentially everything they use. The Beaver Creek drainage has no communities and population data from the region are unavailable. The community of Beaver Creek is outside the drainage on the Yukon River near the mouth of Beaver Creek, and has a population of about 80.

Employment data specific to the Beaver Creek drainage are not available; however, one placer mine is known to have operated in 1987. Employment associated with this operation is estimated at two workmonths because of the late start up.



Chapter IV
Environmental Consequences



BEAVER CREEK

This chapter discusses the potential consequences or impacts of each of the alternatives described in Chapter Two. The intent of this chapter is to provide the scientific and analytical basis of the comparison of the alternatives (Figure 2-5).

Cumulative Impacts

The evaluation of cumulative impacts requires the integration of time, space, mining/non-mining, and federal/non-federal actions in a complex and dynamic environment. The spatial aspect is covered by considering the impacts on the entire watershed, including the drainage of the Wild River, resulting from multiple mining operations in the headwaters of Beaver Creek (Placer Mining Operations and Access Roads Map, Chapter One). Time is considered by evaluating the past, present, and reasonably foreseeable future actions of placer mining. Past and present impacts are part of the existing environment, discussed in detail in Chapter Three, Affected Environment. The projected number of mines, acreages of disturbance, and miles of roads and trails were calculated using methods outlined in Appendix B-1, and are summarized in Figures 2-2, 2-3, and 2-4. Future impacts are discussed in this chapter, Environmental Consequences. There are only federal mining claims in this watershed, so impacts from non-federal mines are not of concern. Non-mining actions are discussed in Chapters Three and Four as appropriate.

Cumulative impacts have their root in placer mining activities that have taken place in the basin for over 90 years. This EIS considers the ways in which future mining would differ from, and may modify the effects of, past mining to arrive at conclusions of overall cumulative impacts. Federal and State regulatory legislation and activities have become more focused in recent years, and placer miners generally have improved the quality of placer mining techniques. Consequently, future mining would have a lesser degree of negative environmental impacts than did past mining. In some cases, future mining will help ameliorate the effects of past mining; these instances are discussed in the text.

For a summary of the impacts and comparison between alternatives, reference Figure 2-7, which depicts past, 1987, and projected 1998 impacts for the Proposed Action and each alternative.

Projection of Mines

Five mines were selected to represent the projected number of placer mines that would operate in the Beaver Creek drainage over the next 10 years under the Proposed Action. This number of mines was chosen because it corresponds with the number of mining proposals the Steese/White Mountains District received for the drainage in 1987, and because five mines represents a reasonable estimation of mining activity within the foreseeable future. This level of mining may be high in estimating future mining activity, since only one mine has operated at any given time over the past six or seven years. Ten years was selected as a time frame for discussion because it corresponds to the period for review of RMPs; and is not intended to limit the period of study.

Projecting the number of mines that would operate under Alternatives A, B, and C was based on the compliance costs of these alternatives as compared to the Proposed Action's compliance costs, to meet water quality requirements. These costs are listed in Figure 2-6, and a comparison clearly indi-

cates that the estimated water treatment costs for Alternatives A, B, and C are significantly higher than those estimated for the Proposed Action. Due to the significant increase in compliance cost, BLM estimated that only four mines would operate under Alternatives A and B. Similarly, three mines would operate under Alternative C due to increases in water treatment and reclamation costs.

The water treatment costs cited in Figure 2-6 were taken from an EPA report (EPA 1987b) that analyzed the economic impact of effluent standards on the placer mining industry. In the EPA report, six water treatment technology options were outlined and their associated costs for Alaska were estimated. BLM reviewed these options and selected the three treatment technologies that came closest to meeting the various water quality standards of the Proposed Action and Alternatives A, B, and C. It is anticipated that Option Two, a simple settling system composed of several settling ponds, would meet the water quality standards, with EPA variances, for the Proposed Action. Alternatives A and B, with water quality standards of .2 ml/l settleable solids and 5 NTU turbidity, and no EPA variances, would require operating with no seepage of effluent to the stream, or the Option Four water treatment technology listed by EPA. Water treatment Option Four consists of several settling ponds and 100% recycling of process water. Alternative C, with water quality standards of zero ml/l settleable solids and zero NTU turbidity increase, would require operations comparable to the Option 6c water treatment technology, composed of several settling ponds, 100% recycling of process water, and chemical treatment of mine effluent. The costs in Figure 2-6 represent a mine that processes 50,000 cubic yards per mining season.

A worst-case scenario to describe a level of placer mining more intense than expected was analyzed to predict those possible cumulative environmental impacts. This scenario could occur if unforeseeable circumstances caused this high level of activity, such as the value of gold increasing by several hundred percent. This analysis is presented in Appendix B-2.

Under any of the alternatives, special considerations are:

- Cumulative Impacts
- Unavoidable Adverse Impacts
- Short and Long-Term Impacts on Productivity of Resources
- Irreversible and Irretrievable Commitments of Resources.

4.1 Geology and Topography

The scale of surface disturbance attendant to placer mining and related activities is quite small relative to that of natural topographic features as generally perceived. Further, such disturbances would be confined principally to redistribution of unconsolidated/semi-consolidated surficial geologic materials, which should generally be amenable to subsequent reclamation. Appreciable portions of streams and riparian areas are subject to short-term disturbance, frequently rather intensive in character, but long-term impacts are subject to prevention-amelioration via responsible, substantive reclamation efforts.

Each alternative requires some reclamation, which should result in little net modification of the overall topography of areas which have undergone mining activities. There would be some short-term, quite local and small-scale landscape modification impacts during mining activities. These modifications should be subsequently reclaimed, and yield few or no significant long-term impacts. A principal objective of effective reclamation is to return the landscape to a condition similar to that which existed prior to mining activity disturbances. Thus, with the increasingly more stringent reclamation standards, from Alternative A, to Alternative B, to Alternative C and Proposed Action, effects on topography which involve stream channel and riparian disturbances would be increasingly minimized. There should be little likelihood of irreversible or irretrievable commitments of topographic resources, in the sense of appreciable or significant net landscape modification under any of these alternatives. The required reclamation, under any of the alternatives, could also result in reclamation of adjacent older disturbed areas as well.

4.1.1 Proposed Action

Approximately 115 acres of river benches and bottom grounds would be disturbed and 80 acres would be reclaimed within 10 years, with the remainder reclaimed at the end of the mine life. Therefore, no significant cumulative impacts on topography, given the required reclamation, are expected.

Direct effects may be significant during actual mining due to disturbance and redistribution of gravel, overburden, and related materials. Indirect effects related to this would be due principally to the possibility of increased erosion of these materials during and after such disturbance, although required reclamation would minimize this.

4.1.2 Alternative A

There could be discernible modifications of landscape aspect under this alternative, since the reclamation requirements are directed only to stabilization of disturbed areas; reconfiguration is not required. However, the scale of these alterations in aspect would be relatively small in the overall context of the topographic features in this area of appreciable natural relief. Past disturbances covers approximately 350 acres; projected disturbance over 10 years is 100 acres.

4.1.3 Alternative B

Impacts under Alternative B would be the same as the Proposed Action, except 100 acres would be disturbed.

4.1.4 Alternative C

Impacts under Alternative C would be the same as the Proposed Action, except that 84 acres would be disturbed.

4.1.5 Alternative D

The cumulative impacts under Alternative D would be similar to the Proposed Action, except that no further mining-related disturbance would occur. Cessation of mining would end direct effects, and reduce further residual effects to the minimum.

4.1.6 Special Considerations

Cumulative Impacts

Total cumulative impacts to geology and topography would consist of past and current impacts in addition to those impacts discussed under each alternative. Historic mining in the area has disturbed over 350 acres of river benches and bottomlands, and three acres of old tailings were mined in 1987. Forty acres of this area have been reclaimed by reshaping and stabilization. Under the Proposed Action, the total cumulative impact would be 345 acres unreclaimed in 1998; Alternative A and B would result in 340 acres total unreclaimed area; Alternative C would result in 336 acres of unreclaimed land, and Alternative D would have only the historic disturbance, 310 acres.

Unavoidable Adverse Impacts

For all alternatives except A, there would be some minimal alteration of original site aspect, as adequate reclamation does not necessitate attempting to restore the site identically to the original configuration. During mining, the site aspect would be modified to some degree, dependent upon the particular situation; this might be deemed obtrusive in some situations.

For Alternative A, the impacts would in general, be similar to those discussed under the Proposed Action. Reconfiguration, except as necessary to stabilize against erosion, would not be required as part of reclamation, thus readily discernible resultant impacts to landscape aspect might result; these would be small-scale, however, in terms of the overall topography in this region of appreciable relief.

Short-Term Uses vs Long-Term Productivity of Resource

For all alternatives, except A, and D, there would be some short- term modification of site aspect during mining, which would, however, not significantly impact the overall topographic setting of the affected area, since the required reclamation would include reconfiguration and stabilization.

For Alternative A, the situation would, in general, be similar to the discussion under the Proposed Action. However, reclamation would not require reconfiguration, except where necessary to stabilize against erosion. Thus some of the more obtrusive short- term disturbances of landscape aspect may persist over a longer term after the cessation of mining.

For Alternative D, cessation of all mining would end further short-term and long-term impingements upon topography.

Irreversible and Irretrievable Commitments of Resources

For all alternatives except A and D, there would be no significant irreversible and irretrievable commitments, since the required reclamation would be directed toward reconfiguration and stabilization of the disturbed areas.

For Alternative A, the situation would, in general, be similar to the discussion under the Proposed Action. The possible persistence of some landscape modifications might be construed as representing a commitment, in terms of changed site aspect. However, this should be on a relatively small scale, and be relatively unobtrusive, when viewed in the context of the overall topographic relationships within this region of appreciable relief.

For Alternative D, cessation of all mining would end any further resource commitments.

4.2 Mineral Resources

The Alternatives become successively somewhat more restrictive to mineral resource development activities, from A to B to the Proposed Action to C, while D precludes mining. Thus, the short- term impacts, successively, are likely to be increased costs and inhibited further development of known mineral deposits because of the severity of such restrictions. For the short-term, most operators will try to meet these conditions; their success will vary, and depend on a complex of physical and economic factors, unique to each location, deposit, and operator. In the long term, there could well be a reduction in the number of operations, the size and scale of which will need modification. ANILCA and the White Mountains National Recreation Area Resource Management Plan (DOI 1984) preclude further location (or leasing) of placer deposits, respectively, restricting mining activities to the exercise of valid rights existing at the time ANILCA was passed. Thus, Alternatives A,B,C, and the Proposed Action would have no additional effects on expansion of placer mining in the WMNRA.

"Commitment" of resources can be construed in one of two ways, somewhat simplistically, with regard to mineral resources. One view is that resources not developed, remaining in the earth, represent a "savings account" for possible future use. There is no irreversible-irretrievable commitment of mineral resources from this perspective; they merely remain unused and undiscovered, subject to future events. This view is frequently advocated with the avowed intent of preserving valuable resources for future, presumably more pressing, societal needs, including dire emergencies. However, there is inevitably appreciable time and effort required in order to obtain a product useful to society from even the known deposits (let alone undiscovered resources) of mineral raw materials in the earth. Thus, this interpretation of preservation for future urgent needs is not totally consistent with physical reality. Further, inhibition of mineral resource development in an area inexorably carries with it the corollary inhibition of exploration for extensions of known deposits and/or new deposits. This, in another sense, represent "irreversible and irretrievable commitment" of undiscovered resources, via ignorance of their existence, to a limbo of non-use by humanity.

Alternatively, development of mineral resources entails, obviously, physical removal from the earth, and "commitment" to other uses-presumably of benefit to human society, both physically as well as economically. The minerals themselves are thus consigned, irreversibly and irretrievably, to human use, including repeated recycling in many instances.

Thus, as restrictions on development of the mineral resources increase, from Alternative A to the Proposed Action through D, the likelihood of "commitment" of the resources, in the first sense as used above increases. Conversely, of course, the likelihood of "commitment" in the second sense as used above decreases, similarly. "Commitment of mineral resources" is used in this EIS in the second sense, (i.e., development); hence Alternative A would be most likely to be accompanied by maximum commitment, Alternative B, the Proposed Action, and Alternative C successively less, with no further commitment under Alternative D.

The negative impacts are of potential region-wide significance due to the fact that cessations of mining activities in the Beaver Creek study area would be additive to other such closures/restrictions which have been or may be implemented elsewhere within the region. Collectively, these actions represent a negative impact on mineral resources exploration/potential development activities, as attested to by decreases in such activities in recent years, region-wide. The indirect effects, additionally, include the reduction of the level of mineral resources exploration/development activities elsewhere in the state, by organizations which otherwise would be carrying out regional programs. Further indirect effects relate to economic losses due to such reduced levels of activity, as well as losses of new values resulting from mineral resources production and sales. These would represent negative local, regional, state-wide, and national impacts.

4.2.1 Proposed Action

There would be no significant impacts on mineral resource availability for development.

4.2.2 Alternative A

Impacts would be the same as the Proposed Action.

4.2.3 Alternative B

Impacts would be the same as the Proposed Action.

4.2.4 Alternative C

Impacts would be the same as the Proposed Action.

4.2.5 Alternative D

Under Alternative D mining activity, resource development and use would end. There would be severe negative impacts on exploration, extension, and development of known and unknown resources in the area and region.

Under Alternative D there would be the direct effect of cessation of mining activities, as well as related exploration and development, plus the indirect negative effect on exploration and development elsewhere in Alaska as well. Known and undiscovered resources which otherwise might have been of value to society would be unused.

4.2.6 Special Considerations

Cumulative Impacts

Total cumulative impacts upon mineral resources in terms of development of those resource actually known to exist as well as those presently undefined consist of past and current impacts, in addition to the impacts discussed under each alternative. There are severe limitations to quantitative evaluation of these impacts, due to data shortcomings concerning past production, and serious uncertainties regarding meaningful estimates of remaining resources.

Cumulative production of placer gold, the principal mineral resource developed to date, is estimated to have been on the order of 29,000 ounces from Nome Creek and its tributaries. It is estimated that there is an additional 6,500 ounces yet to be recovered from Nome Creek, and perhaps on the order of 4,000- 21,000 ounces of other yet undiscovered gold within the portions of the WMNRA which appear to have the greatest potential for such resources. These estimates do not address other potential mineral resource commodities/deposit types.

Qualitatively, the historical past has seen few restrictions on development of mineral resources within the watershed, other than those attendant to economics, remoteness, climate, and related factors. Performance standards in the alternatives and regulations of other agencies essentially add some restriction to the unregulated development of mineral resources. Alternatives A and B would essentially continue the historical situation while the Proposed Action would be somewhat restrictive, and Alternative C would be more restrictive to mineral resource development. Alternative D would preclude further mineral resource extraction.

Unavoidable Adverse Impacts

There would be no significant impacts under the Proposed Action or Alternatives A, B, and C. Alternative D calls for a total cessation of mining and related activities.

Short-Term Uses vs Long-Term Productivity of Resource

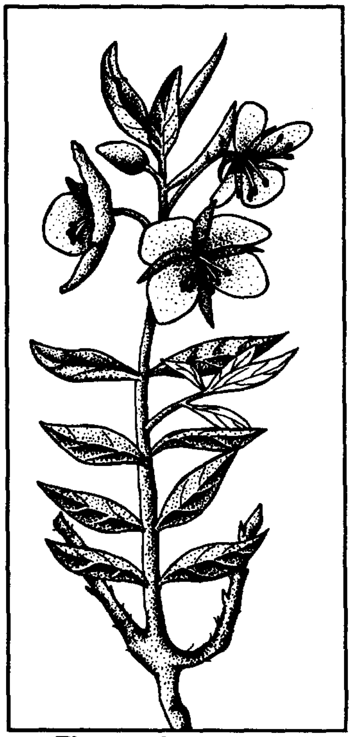
For all alternatives except D, short-term production of non- renewable resources necessarily implies decreased productivity at some future time. However, without development and use, mineral resources are "resources" only in a somewhat hypothetical sense. In the case of Alternative D, both short-term uses and long-term productivity will effectively be precluded.

Irreversible and Irretrievable Commitment of Resources

Mineral resources developed and produced represent irreversible and irretrievable commitments to human use. The resources may be recyclable, but are ultimately non-renewable, in terms of human use. This will be the case for all alternatives except D.

For Alternative D, such mineral resources as may be present would be consigned, irreversibly and irretrievably, to a limbo of no development of known resources and ignorance of existence of presently undiscovered resources. This would be subject, presumably, to possible subsequent changes in law under future circumstances.

4.3 Soils


Fireweed

The initial direct impact to soils from placer mining is the same under all alternatives; the differences are the extent of ground disturbed and measures taken to promote recovery. Generally, placer mining completely destroys the soil profile through the stripping of overburden and processing of gold-bearing gravels. The usual procedure is for the overburden (including organic materials) to be stripped, coarse underlying materials separated from gold-bearing material in the processing plant, and fine materials treated or discharged with the wastewater stream. Three categories of wastes are produced as distinct units: overburden moved to the perimeter of the area of operation, larger rock and soil material deposited as tailings, and fine material collected in settling ponds or discharged with the wastewater stream. Under natural processes, recovery from such disturbance occurs gradually over what may be a considerable period. Sidecast overburden begins to recover immediately. Revegetation of undisturbed fine sediments in settling ponds may begin as soon as the ponds are drained. Washed tailing piles, however, differ because they lack fine materials to trap moisture, so revegetation of these features is a very slow process. Initial growth occurs near waterline or where fine materials remain at or near the surface as a result of incomplete processing. Vegetative cover develops gradually in depressions or on the tops of the piles where wind or water-borne fine materials or organics accumulate, or where weathering is sufficient to degrade the coarser materials. Soil development and revegetation of more resistant or exposed areas of the tailings may

require decades. The vegetation which occurs in such disturbed areas is typical of that which occurs in well-drained, warmer soils. All mining alternatives would result in long-term unavoidable impacts to the soils in the areas disturbed by mining.

4.3.1 Proposed Action

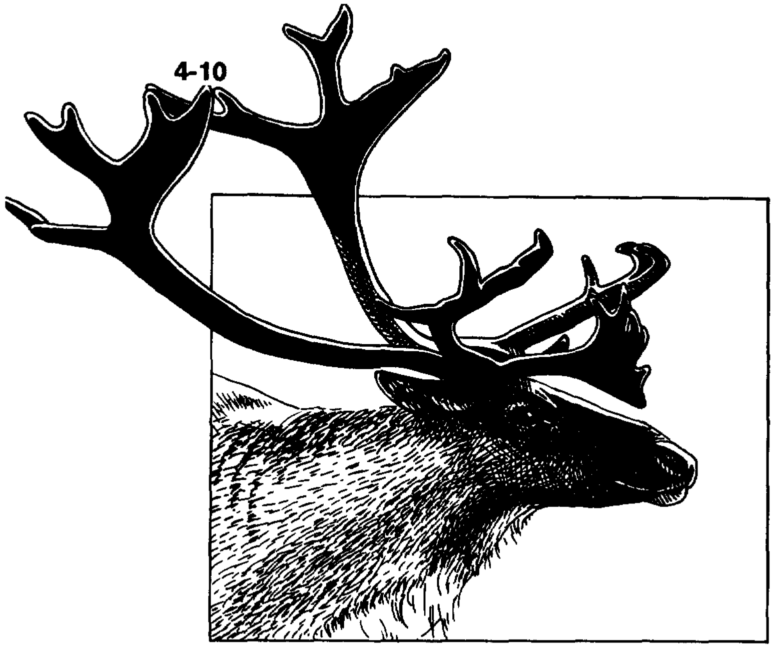
It is estimated that approximately 115 additional acres would be disturbed by 1998, with reclamation occurring on 80 acres. The soil profile would be completely altered on all these disturbed areas. Anticipated disturbance of the soil profile and/or compaction of soils would occur on the 33.4 miles of road and 21 miles of trail. This alternative essentially would provide for enhanced restoration of the disturbed area. All operators would reestablish the stream channel in the original floodplain, reshape tailings and distribute the fine material and overburden, and enhance regrowth of the vegetative cover. The redistribution of fine material should reduce the possibility of large quantities of sediment entering the stream system and would provide for a more uniform development of soil stability over the entire disturbed area. Enhanced revegetation would probably speed up the process of surface stabilization and would reduce the rate of erosion from the disturbed acreage. Slope angles would approximate the original contour. These reclamation practices should allow for retention of soil materials on site and development of soil stability through revegetation in 25-30 years (Chapter 4.5, Landcover).

4.3.2 Alternative A

The physical impacts to soils under this alternative would be similar to the Proposed Action but with somewhat less intensive reclamation required. Another difference lies in the areal extent of disturbance. A reduction from 115 to 100 acres of disturbance and from 80 to 70 acres of reclamation would not be a significant watershed-wide difference. Stockpiling and respreading of overburden is not required under this alternative. Recovery of vegetation and attendant soil stability would occur more slowly than under the Proposed Action (50 years or more) and a higher proportion of disturbed area would remain barren or sparsely vegetated, thus subject to higher non-point erosion.

4.3.3 Alternative B

The initial physical impacts to soils would be the same as for Alternative A, with 100 acres of disturbance and 70 acres of reclamation, 29.1 miles of road, and 18.3 miles of trail. The different reclamation practices would determine the eventual impact on soils. All operators would be required to recontour tailings and respread the overburden. This would result in lower rates of erosion from the disturbed area by providing some protection to the inorganic soil material. Additionally, respreading of any organic overburden would promote the development of vegetative cover by providing microrelief to trap moisture and seeds. Slope angles would approximate the original contour.


Caribou

4.3.4 Alternative C

Anticipated impacts would occur on 84 acres of ground, with 58 acres of reclamation occurring by 1998. Approximately 24.4 miles of road and 15.3 miles of trail would be expected. Initial mining operations would destroy the original soil profile on all impacted acreage. This alternative essentially would provide for enhanced restoration of the disturbed area. All operators would reestablish the stream channel in the original floodplain, reshape tailings and distribute the fine material and overburden, and enhance regrowth of the vegetative cover. The redistribution of fine material should reduce the possibility of large quantities of sediment entering the stream system and would provide for a more uniform development of soil stability over the entire disturbed area. Enhanced revegetation would probably speed up the process of surface stabilization and would reduce the rate of erosion from the disturbed acreage. Slope angles would approximate the original contour. These reclamation practices should allow for retention of soil materials on site and development of soil stability through revegetation in 25-30 years (Chapter 4.5, Landcover).

4.3.5 Alternative D

All areas disturbed since 1980 would be stabilized and no new areas would be disturbed by placer mining. This would result in impacts similar to Alternative A, only to a lesser areal extent. Development and succession of plant communities would generally take a long time and would not be uniform over the disturbed area due to the uneven mixing of fine material in the disturbed areas. Past mining disturbance covers approximately 350 acres.

4.3.6 Special Considerations

Cumulative Impacts

Total cumulative impacts to soils consists of past and current impacts in addition to those impacts discussed under each alternative. The soils profile is destroyed for long periods in areas of active dredging or sluicing, and shorter term impacts of soil compaction and alteration occur in areas of facilities, roads, and trails. Historic mining has disturbed over 350 acres of river benches and bottomlands; trails and roads currently cover approximately 130 acres of the watershed. Three acres of old tailings were mined in 1987. Under each alternative, some of the projected mining may occur on old tailings, making the impacted acreage somewhat less than the totals listed below.

Under the Proposed Action, the total cumulative impact would be up to 470 acres of mining, and 280 acres of compaction under roads and trails. Alternatives A and B would result in 450 acres total mined area, with an additional 240 acres under roads and trails. Alternative C would result in up to 440 acres of mined land, plus 200 acres under roads and trails. Alternative D would have only the historic disturbance, 350 acres, with 130 acres of roads and trails.

Unavoidable Adverse Impacts

The soil profile would be completely altered by mining operations on approximately 115 acres of ground for the Proposed Action, 100 acres for Alternatives A and B, and 84 acres under Alternative C. Soil conditions may be impacted by access roads and trails through disturbance of the soil profile, or from compaction. This would not be a significant watershed-wide impact on soil resources. Alternative D impacts are discussed in Section 4.3.5.

Irreversible and Irretrievable Commitment of Resources

The irretrievable commitment of soil resources on mining claims affected under the Proposed Action and Alternatives A, B, and C would include soil materials moved off site by erosion. Soil profiles would be completely disrupted in the areas affected.

Under Alternative D there would be no further irreversible and irretrievable commitment of soil resources,except small amounts of erosion from unreclaimed tailings.

4.4 Water Resources

The primary impact to water quality to be expected from placer mining operations in the basin is an increase in sedimentation. Turbidity would also impact the water quality of Beaver Creek; however, to a lesser degree than sedimentation because the cumulative impact of increased turbidity is limited to a 5 NTU increase over the natural condition of the receiving stream unless the operator has a valid NPDES permit. Well conceived, documented sediment measurement work has not been conducted in Alaska streams for a long enough period, or under conditions which allow for an adequate comparison of mined and unmined waters, and which consider the relative contribution of sediment from various sources. Additionally, the short period of data collection has included substantial variations due to cyclic conditions such as rainfall, snowpack, surface vegetation, and other sediment-causing activities such as roads, and various mining techniques. In other words, several years of data do not produce the confidence levels needed to use the data with any sense of validity.

Recognizing this, together with the fact that the White Mountains NRA Resource Management Plan calls for monitoring and evaluation, which should improve the data base, the EIS team used a sediment model based on EPA data to estimate a sediment rate for the Proposed Action. This model identifies several classes of activities that result in sediment generation (EPA 1973). The relative

comparisons among and between these activities were used as a basis for the model. See Appendix E-1 for details on this sediment model. **This model does not purport to be site-specific to this drainage and is only used for relative comparison of the alternatives.**

The nature of the basin, its geology, and the relative size of the affected drainages are such that one would not expect a significant change in the chemical components such as heavy metals or ions. In a report published by the Bureau of Mines (Fechner and Balen 1988), geochemically anomalous values of some such constituents were reported for sedimentary materials in the basin, from all drainages sampled. As discussed in LaPerriere, et al. (1985), placer mining activities can result in an increase in such constituents in stream systems. However, Mack and Moorman (1986) found that concentrations of heavy metals in samples taken from mined streams did not exceed State water quality standards in the absence of elevated total suspended sediment. This is verified by the EPA in their response to comments on the 1988 placer mining NPDES permits, which states in part:

> "Treatment studies show that metals found in placer mining effluents are associated with soil particles and are removed at the same time other solids are removed from the wastewater."

Similarly, any increase in biological constituents is not expected to be significant.

Because placer mining is considered to be a non-consumptive use of water, there would be no significant impact on water quantity under the Proposed Action or any of the alternatives.

Hazardous Materials

Considering the types and amounts of hazardous materials, fuel and oil, used by small placer mining operations, the lack of long-term storage of large quantities, and the lack of any history of significant spills requiring clean-up or mitigation, it is not anticipated that there would be a significant cumulative impact to the environment under any of the alternatives. Implementation of the waste treatment and disposal regulations will make such impact even less likely in the future.

4.4.1 Proposed Action

Under this alternative, the projections are:

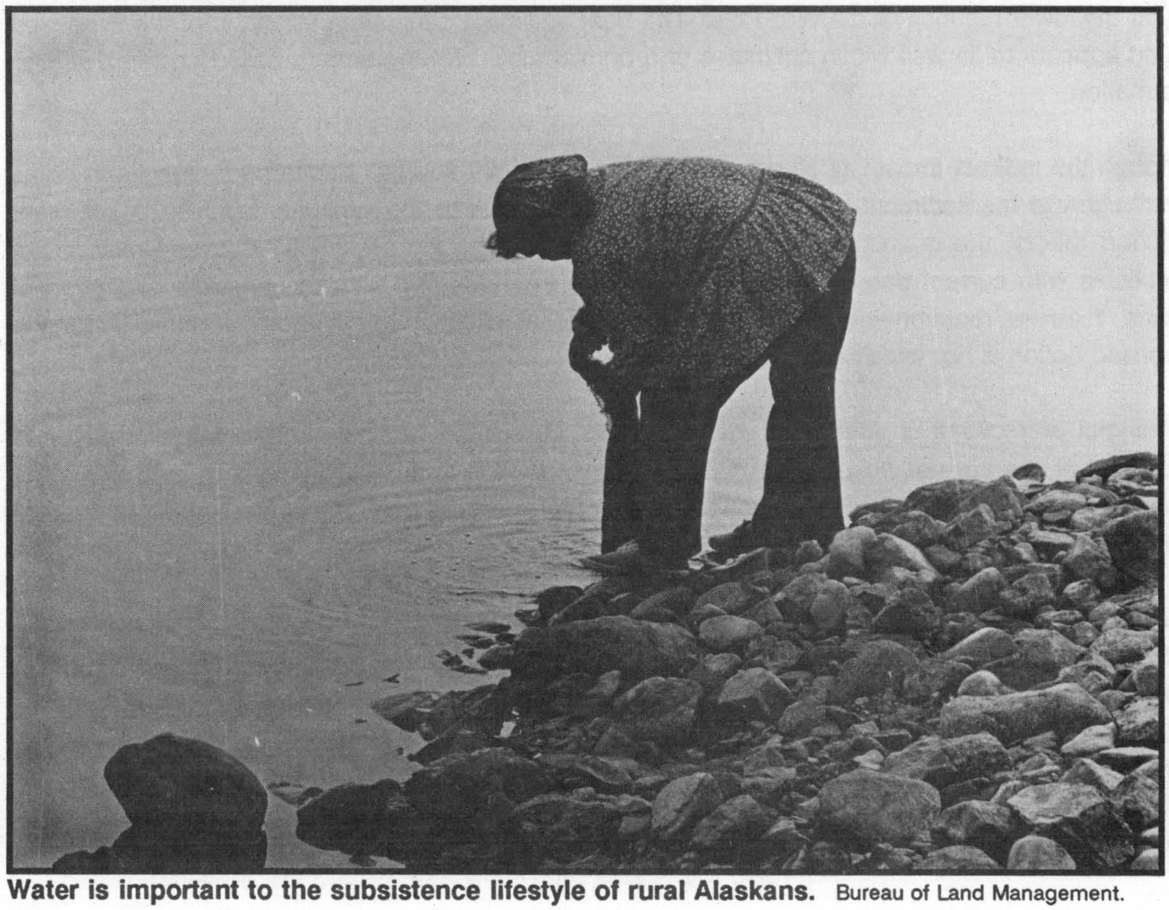
1) By 1998, the number of active mines would increase from one to five. Acreage disturbed would increase by 115 acres (in addition to 352 acres of historic disturbance), with reclamation on 80 acres. There would be 33.4 miles of road and 21 miles of trails.

2) All operators would be required to meet the State of Alaska and/or EPA standards for discharge or appropriate variances, and responsibility to enforce these standards lies with those agencies. Any suspected violation of water quality standards would be reported to the appropriate agency for enforcement action.

3) Reclamation would consist of channel restoration, respreading and shaping of tailings, and redistribution of fines and restoration of vegetation on all operations.

Stream channel morphology would be directly affected in all areas where mining takes place in the active channel; however, restoration of the stream channel would reduce impacts to short-term, occurring only as long as the operation is active. The five operations predicted in the area by 1998 would probably affect 1.25 miles of stream channel (an average of 0.25 miles per mine). The percentage of stream channel and bench disturbance would not exceed approximately 0.4% (1.25 miles disturbed out of 342 miles total) and 0.05% (0.75 mi^2 disturbed out of 1,683 mi^2 total) respectively. For this reason it is not expected that a significant change in runoff characteristics would occur.

Some direct effects on water quality can be anticipated during the development stage of an operation due to the construction of settling ponds and stream bypasses, and through rechannelization of the stream, if required. These activities would result in short-term increases in sediment levels and turbidity while equipment operates in the active stream channel. In addition, occasional high water or failure of water control structures would introduce sediments collected by the water treatment system into the stream channel. This would create short-term increases in turbidity and possible localized sedimentation of the stream substrate. The degree of impact would depend on the amount of material released and the streamflow at the time of release. Turbidity would probably be detectable downstream on Beaver Creek for short periods of time.



Water is important to the subsistence lifestyle of rural Alaskans. Bureau of Land Management.

Indirect impacts to water quality include accelerated erosion from disturbed areas until fully successful revegetation of the site is achieved. Water quality is indirectly affected during this process through the introduction of sediment to the water column, which can be a long-term impact. Channel cutting would also occur until the stream reaches equilibrium. These processes would introduce sediment into the stream system, particularly during spring breakup and periods of high water runoff. These impacts would be expected to occur for approximately 30 years or until stabilization is achieved and successful regrowth is established. Given the reclamation standards of the Proposed Action, stream channel stability would be required when operations shut down and the disturbed area should be successfully revegetated to a tall shrub community in approximately 25 to 30 years based on regrowth rates in Line I (Figure 4-2, Section 4.5) for previously mined- ground, and between the rates indicated by Lines III and IV for virgin ground. In the ten year time frame, vegetation would cover up to 60% of the reclaimed tailings.

BLM estimates that the natural soil loss and erosion from the Beaver Creek watershed under the Proposed Action would be approximately 72,000 tons per year, or about 360 tons per day based on a 200-day open water season (See Appendix E-1). If the figures for a stream in the central portion of the Upper Yukon subregion (less than 100 to as much as 500 mg/l sediment concentration) (Selkregg 1974) are used, along with the assumption that the average summer flow of Beaver Creek in the reach just above Victoria Creek (at the lower end of the Wild River) is approximately 649 cubic feet per second, then the expected sediment load in naturally occurring waters in this watershed could be expected to be from less than 175 tons per day to as much as 876 tons per day at the lower reaches of the Wild River. The BLM sediment generation estimate for the Proposed Action appears to lie well within estimates of a normal clear- flowing stream based on the Selkregg information.

Although the indirect impact of placer mining from non-point sources undoubtedly results in some contribution to the sediment load of the stream system, due to the variables involved in sediment transport theory, the quantity of sediment moved or through the system by Beaver Creek is not identifiable with current data. However, this analysis indicates that with the possible exception of storms, if permit requirements are met, the downstream effect from non-point sources under the Proposed Action is not expected to be significant.

Meaningful predictions of streambed sedimentation, associated turbidity, and possible impacts as discussed above are not possible (Water Resources, Section 3.4). However, the degree of impact should not be significant due to the naturally-occurring sediment load, the limited impacted area of mining operations, and the large amount of dilution.

The impact on chemical water quality is unknown. However, the AHC (1988) study on heavily mined Birch Creek concludes that, although data are limited, of the parameters tested only those for iron and manganese were found to be in violation of State water quality standards. Both of these constituents are common toxicity metals found in many ground and surface water supplies in Alaska. With the relatively small amount of mining in the Beaver Creek watershed, the impact on chemical water quality would not be expected to be significant. Control of sediments should further limit such impacts (see discussion, Section 4.4).

There would be no expected detectable changes in the channel morphology of Beaver Creek due to increased sedimentation downstream from the mining areas if compliance with water quality standards is attained.

Because roads and trails in the area now and in the future would be expected to be constructed away from the stream channels, the impact on water quality should not be significant. Except for sediment discharges during storm events at slopes to stream crossings, most of the material eroded from road surfaces would be quickly intercepted and contained by the surrounding vegetation.

4.4.2 Alternative A

Under this alternative, the projections are:

1) By 1998 there would be four federal mining operations in the watershed, resulting in a total disturbance of 100 acres with 70 acres reclaimed. There would be 29.1 miles of road and 18.3 miles of trail. Approximately one mile of stream channel would be directly impacted.

2) All federal mining operations would meet water quality performance standards of 0.2 ml/l settleable solids and 5 NTU (Section 2.3).

Effects and analysis would be similar to that for the Proposed Action except that the reclamation standards of this alternative provide for reshaping tailing and stabilizing overburden against erosion, but not respreading it to facilitate revegetation during reclamation and do not require restoration of the stream channel. This practice tends to reduce the sinuosity of channels and increase channel gradient. This creates an area of channel degradation at the upper end of the disturbance. The vegetation regrowth rates would correspond to Lines I and II (Figure 4-2) for previously mined and virgin ground. With this level of revegetation, the expected sediment load rate per acre would be greater than for the Proposed Action, but the difference between sediment rates cannot be predicted without suitable sedimentation studies. The impact of possible changes in the chemical water quality is not known.

There would be no detectable changes in channel morphology due to increased sedimentation downstream from the mined areas. The reduction in the amount of roads and trails in the watershed would reduce the potential impact, but quantification is not possible due to highly variable site conditions.

4.4.3 Alternative B

Under this alternative, the assumptions would be the same as for Alternative A except that overburden and topsoil would be respread over reshaped tailings. There would be no significant impact on water quantity under this alternative.

The impacts and analysis under this alternative would be the same as for Alternative A except that turbidity increase would probably be lower because of increased regrowth due to the respreading of overburden. This would result in a moderate rate of vegetation regrowth, especially on previously unmined areas where topsoil and overburden would be available to respread over the reshaped tailings. Regrowth rates would correspond to Lines I and III in Figure 4-2. Depending on the length of time since reclamation, vegetation cover would be 0 to 25% in 30-50 years. The sediment load rate per acre is estimated to be greater than that of the Proposed Action, but less than that of Alternative A. Total sediment load into the stream would probably be less than the Proposed Action because fewer acres are predicted to be disturbed. These reclamation standards would reduce the period that non-point source introduction of sediment from disturbed areas would occur. The impact of possible changes in the chemical water quality is not known.

4.4.4 Alternative C

Under this alternative, the projections would be the same as for the Proposed Action except that:

1) All operations would meet performance standards of 0.0 ml/l settleable solids and 0 NTU above natural background.

2) By 1998 there would be three federal mining operations in the watershed, resulting in a total disturbance of 84 acres with 58 acres of reclamation. There would be 24.4 miles of road and 15.3 miles of trail, and approximately 0.75 miles of stream channel would be directly impacted.

Channel morphology would be impacted the same as for the Proposed Action.

Direct and indirect impacts and analysis would be the same as for the Proposed Action. The sediment load rate per acre would be reduced slightly from that of the Proposed Action due to stricter water quality performance standards; however, the magnitude is unknown. The impact on chemical water quality is unknown, but should not be significant.

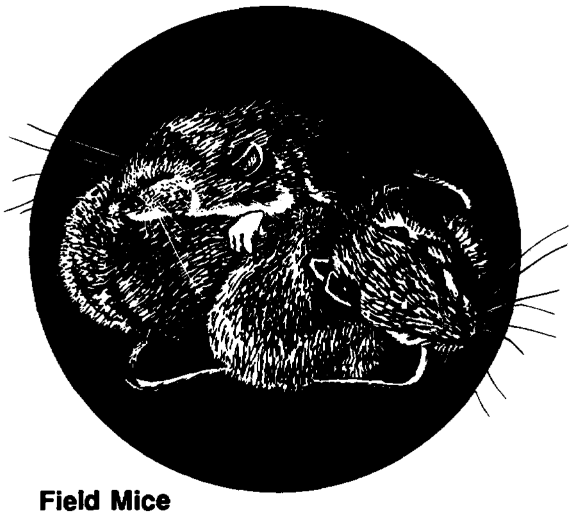
There would be no detectable changes in channel morphology due to increased sedimentation downstream from the mined areas.

4.4.5 Alternative D

Under this alternative, the assumptions are:

1) No mining operations would be allowed in the area and there would be 7.2 miles of road and 23.3 miles of trail.

2) All areas disturbed by mining operations since 1980 would be required to be stabilized.



Field Mice

Because there would be no use of water in the system, there would be no direct impacts on water quantity under this alternative, other than that due to stabilization effects. Indirect impacts would be the same as for the other alternatives. The degree of indirect impacts would not be significant enough to be easily detectable downstream on Beaver Creek at any time, except during the highest flows. Regrowth rates for the existing disturbed areas would correspond to Line I in Figure 4-2. Many of the fines have already eroded from these tailings, and the sediment load rate should be less than that of the Proposed Action. Sediment loads would approximate the existing situation, with gradually decreasing sediment load from mining-related disturbances. The impact on chemical water quality is unknown, but should approximate the natural conditions of the watershed since it is anticipated there would be no placer mining development. There would be no detectable changes in channel morphology due to increased sedimentation downstream from the mined areas.

4.4.6 Special Considerations

Cumulative Impacts

Total cumulative impacts to water resources consist of past and current impacts in addition to those impacts discussed under each alternative. Historic mining has disturbed approximately nine miles of the Nome Creek streambed. The mining activity of 1987 was in an area of previously disturbed floodplain. Mined reaches of Nome Creek are generally characterized by straight, shallow, high velocity, and frequently split stream channels with unstable banks.

Future mining in previously mined areas may result in reclamation of portions of this stream channel using performance standards of the Proposed Action and Alternative C. Up to 1.25 miles of stream channel may be mined and reclaimed under the Proposed Action, resulting in a total of 7.75 to 9 miles of unreclaimed stream channel in the watershed. Alternatives A and B may add up to one mile of additional straight stream channel, for a total of ten miles. Alternative C would result in 8.25 to 9 miles of total unreclaimed stream. The nine miles of currently unreclaimed floodplain would remain under Alternative D.

There are no historic water quality data collected during previous mining activities in this watershed, so it is difficult to quantify the cumulative impacts to water quality. Non-point sources contribute "cloudiness" to the water column which would probably continue under all mining alternatives. Listed in decreasing relative order of impact from non-point source erosion: Alternative D, Alternative C, Proposed Action, Alternative B, and Alternative A.

Unavoidable Adverse Impacts

Unavoidable adverse impacts would include possible short-term increases in suspended sediment and turbidity during storms, and accelerated erosion from disturbed areas during active operations.

For the Alternatives A and B, unavoidable adverse impacts would be short to long-term increases in suspended sediment and turbidity, accelerated erosion from disturbed areas resulting in a possible increase in sediment introduced into the stream system, and changes in channel morphology in the vicinity of the disturbed area.

Under the Proposed Action and Alternative C unavoidable adverse impacts would be possible short-term increases in suspended sediment and turbidity, and accelerated erosion from disturbed areas during active operations.

Under Alternative D erosion from unreclaimed areas may introduce sediment into the stream system, particularly during periods of high water runoff.

Short-Term Uses vs. Long-Term Productivity

Under the Proposed Action and Alternatives A, B, and C the short- term use of water resources for placer mining would affect the long-term productivity by accelerating erosion from disturbed areas and channels, possibly increasing the sediment load of the stream until it reaches stability and equilibrium. These impacts are not expected to be significant downstream on Beaver Creek.

Under Alternative D there would be no active placer mining use of the water resource and no effect on long-term productivity.

Irreversible and Irretrievable Commitment of Resources

There would be no irreversible or irretrievable commitments of the water resources under the Proposed Action and Alternatives A, B, and C. Water quantity would not be significantly affected, and water quality would return to approximately natural conditions after successful stabilization of disturbed areas. There would be no irreversible or irretrievable commitment of water resources under Alternative D.

4.5 Landcover

Analysis of acreages affected by mining and reclamation is based on projected disturbance for mining and associated claim access roads and trails (Appendix D-1). Estimates of acreages for all alternatives are in Figure 4-1.

	Pre–1981 Disturbance	1987 Season			Proposed Action			Alternative A			Alternative B			Alternative C			Alternative D		
		Dredged tailings	Sluiced tailings	Total	Dredged tailings	Sluiced tailings	Total	Dredged tailings	Sluiced tailings	Total	Dredged tailings	Sluiced tailings	Total	Dredged tailings	Sluiced tailings	Total	Dredged tailings	Sluiced tailings	Total
Acres disturbed from mining	352	—	—	3	—	—	115	—	—	100	—	—	100	—	—	84	—	—	0
Acres disturbed from trails	84	—	—	84	—	—	76	—	—	66	—	—	66	—	—	55	—	—	85
Acres disturbed from roads	43	—	—	43	—	—	202	—	—	176	—	—	176	—	—	148	—	—	43
Acres reclaimed	40	—	—	3	—	—	80	—	—	70	—	—	70	—	—	58	—	—	0
% barren after regrowth on reclaimed land	85%	85%	40%	—	50%	40%	—	85%	75%	—	85%	40%	—	50%	40%	—	85%	40%	—
% barren after regrowth on unreclaimed land	85%	85%	75%	—	85%	75%	—	85%	75%	—	85%	75%	—	85%	75%	—	85%	75%	—
Acres barren after regrowth	300	1.3	1.3	2.5	35.	29	64	42	38	80	42	25	67	26	21	47	0	0	0
Acres barren from mining and roads	– – –	—	—	346	—	—	566	—	—	556	—	—	544	—	—	495	—	—	344
Acres of successional community on dredged tailings	40	0.3	—	40.3	23	—	63	7.5	—	47.5	7.5	—	47.5	16.5	—	56.5	0	0	
Acres of successional community on sluiced tailings	– – –	—	—	0.3	—	28	28	—	12.5	12.5	—	25	25	—	21	21	—	0	0

Figure 4–1. Acreage estimates for impacts of mining on landcover. Sluiced tailings are from mining with a washplant on previously unmined ground.

The major variation among alternatives which would affect landcover is the relative amount of fine materials remixed in the tailings during reclamation. This fine material content affects both the rate of regrowth and the acreage which would recover to a stable productive vegetative community.

Figure 4-2 illustrates various rates of succession on substrates with different percentages of sub-sand sized fine materials. Analysis of the impacts of the alternatives is therefore largely based on the differing regrowth rates resulting from different reclamation techniques and the mix of fine materials in the tailings.

Figure 4-2 was developed using data from studies and observations of regrowth on tailings (Rutherford & Meyer 1981, Holmes 1981, Halloran 1986, Spencer 1987). The four arrowed lines represent average time frames for succession to various vegetation communities. Most disturbed areas in the Beaver Creek watershed will follow this or a similar pattern of native species regrowth. Cumulative effects become apparent when the disturbed area is large enough to influence seed dispersal into barren ground, or when repeated disturbances such as remining old tailings maintain one of the pioneering communities.

A stable, sustaining productive community is considered to be the open tall shrub community, shown on Figure 4-2. This is generally a tall willow and/or alder community with a canopy cover of at least 50% in vegetated areas, where dying vegetation is replaced by seed or vegetative means. Such a community can sustain moderate pressure from wildlife, especially beaver or browsing moose, and may continue on the site indefinitely, or be successional to a deciduous forest with mixed spruce. After mining, successional communities of graminoids, forbs, and shrubs often grow in areas previously occupied by a black spruce/*Sphagnum* community underlain by permafrost. The successional community may provide improved moose browse habitat for a period of several years, until it grows into a more mature forested community.

The Corps of Engineers (1988) analyzes the impacts of placer mining and associated activity on wetlands as:

> "Major impacts to wetlands within the Beaver Creek watershed due to placer mining activities cannot be quantitatively analyzed with existing data. However, it is estimated that over 50% of the total acreage to be disturbed by mining are wetlands of various types or other waters of the United States. The local area of disturbance will be adversely impacted due to the loss of these wetlands and aquatic areas and their associated values and functions. This loss of function and value is the result of the direct removal of wetland vegetation, including riparian vegetation, through clearing, overburden removal, stream diversions, stockpiling of materials, and the construction of foundation pads, new roads and trails and airstrips. Impacts from stream diversions and loss of riparian vegetation have been discussed elsewhere in this assessment (Sections 4.4 and 4.5).
>
> "Other potential impacts include some of the following: compaction of organic surfaces from associated activities in permafrost areas could increase the active layer by reducing the integrity of the insulating vegetative mat resulting in settlement, ponding, material sloughing and thermal erosion; alteration of drainage patterns could affect local wetlands depending on topography--

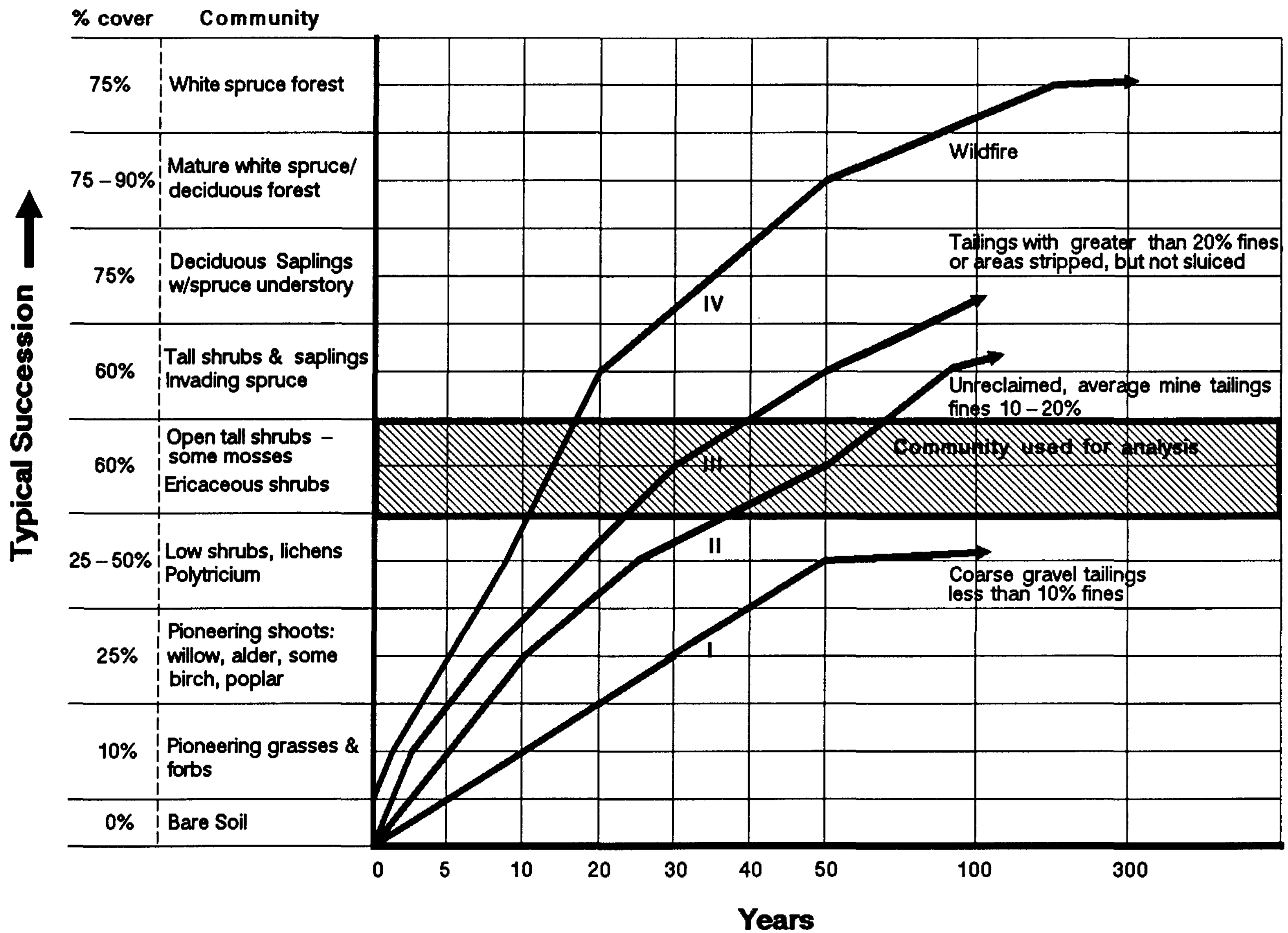


Figure 4 – 2. Comparison of succession rates after various reclamation approaches and natural wildfire.

either through loss of water or the formation of future wetlands through water accumulation; and, sedimentation which can create morphological changes to wetlands located downgrade from placer mining activities.

"There would be the potential for the loss of localized wetland ecosystems and their values. On a local basis this loss of wetland habitat could be major for migratory waterfowl, song birds and small mammal species, but it would not be significant on a greater than local basis. For birds of prey or larger mammal species, direct habitat loss would not be major in areas considered to be critical habitat for certain less mobile species. Removal of wetland vegetation in the case of riparian willow habitat would result in loss of valuable wildlife habitat.

"Indirect habitat loss because of noise, human contact or disturbances directly related to the placer mining operations could affect larger mammals and birds of prey which tend to avoid such areas. The degree of avoidance cannot be accurately predicted. Bears, wolves, wolverines and foxes may initially avoid these areas but would adjust to the intrusion in their range and return to the vicinity in search of food, etc.

"It is impossible to predict whether historic wetlands that originally occurred in many areas could be restored. Tailings and surface areas which have been impacted with placer tailing piles, or stripped of any soils as a result of earlier mining operations are not considered wetlands, nor in many cases have they returned to wetlands through natural succession. At some sites, where excavations for placer mining occurred (i.e. ponds for floating dredges, removal of ore-bearing materials, water retention basins, etc.) areas have become wetlands where time has permitted the invasion of wetland species, a development of hydric soils, and water persisted.

"Long-term benefits will be enhanced by promoting habitat of greater use to wildlife, such as willows for moose browse, settling ponds for waterfowl habitat enhancement, etc. Site specific mitigation measures may not require the leveling of berms, stream diversions returned to original channels, site drainage pattern maintenance, etc., during site rehabilitation, but could require that such structures be left intact to provide for the potential of wetland development.

"Although wetlands restoration is uncertain in many cases, wetlands reestablishment can be encouraged and substantially enhanced by using certain rehabilitation techniques. Regrading tailing piles and other disturbed areas to nearly level, creating ponds and depressions will provide a basis for water retainment; and most importantly, respreading organic soils, mulch and fines over the regraded area will provide a natural seed base and suitable conditions for relatively quick natural vegetation. To ensure this resource will be available for later use, those organics, topsoil and fines which overlay mineral bearing layers must be stockpiled and retained. Streamside, riparian and floodplain wetlands and those associated with high water tables such as springs and seep areas should begin to reestablish themselves within 5-7 years. Permafrost wetland areas may take considerably longer to reoccur, but intermediate successional vegetation such as willows will provide new browse areas for many species and will minimize long term impacts. Although some reestablishment of wetlands will occur within a few growing seasons in

some areas, regaining the full function and values of the impacted wetlands will take many years in most cases. Some may never be reestablished. Specific rehabilitation techniques would depend on site conditions.

"The placement of dredged and fill materials in waters and wetlands requires a Department of the Army permit from the Corps of Engineers under Section 404 of the Clean Water Act. The decision whether a permit will be issued would be based on an evaluation of the probable impacts including cumulative impacts of the proposed activity and its intended use on the public interest. (Those permitting decisions can be tiered from the EIS documents.) Evaluation of the probable impacts on the public interest requires a weighing of all factors including the benefits which reasonably may be expected to accrue from the proposed activity and the reasonably foreseeable detriments. Among those factors relevant for consideration are conservation, economics, aesthetics, general environmental concerns, wetlands, cultural values, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shore erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership, and in general, the needs and welfare of the people. For activities involving Section 404 discharges, a permit will be denied if the discharge that would be authorized by such permit would not comply with the Environmental Protection Agency's 404(b)(1) guidelines (40 CFR, Part 230)." (Corps 1988).

4.5.1 Proposed Action

During 1987, three acres of old dredge tailings were sluiced and reclaimed by leveling. There was little to no topsoil and overburden to spread over the reshaped tailings. The lack of fine materials in the reclaimed tailings retards rapid regrowth of vegetation. Regrowth to a stable, sustaining, productive community of tall shrubs will take approximately 50 years (Figure 4-2). Prior to that, this area will have low to moderate value for big game habitat, especially as winter moose browse (Section 4.6).

As future mining operations disturb ground, topsoil and overburden may be available for respreading over the tailings. The length of time to grow to a stable, productive shrub community would be approximately 25-30 years for disturbance on previously unmined ground. Further disturbance on old dredge tailings would take approximately 30-50 years for regrowth. The difference in regrowth rates is largely attributable to the higher proportion of fine grained materials in tailings from sluicing new ground.

The Proposed Action would require that topsoil and overburden be saved and respread over contoured tailings. With the mining in old tailings, another source of fine materials is necessary to facilitate natural revegetation on the site. One possible source would be fines from the abandoned settling ponds. Further enhancement such as fertilization and seeding may be required by BLM in approving individual Plans of Operation. Neiland (1978) and Peterson and Peterson (1977) point out that fertilization and seeding with domestic species tends to encourage non-native species at the expense of establishment by native species. Both suggest a combination of techniques to facilitate quick regrowth of vegetation to reduce erosion, and to enhance eventual establishment of a com-

munity of native plants. Mowatt (DOI 1987e) outlines many mitigation techniques for preparing soils, as well as considerations for revegetation of tailings during reclamation. The details of such work would have to be site specific, and specified in the individual Plan of Operation for the mine.

On a site where a variety of techniques are used, including mixing of settling pond fine materials in the tailings, fertilization, seeding, and mulching to enhance regrowth, a stable, sustaining community of tall shrubs will be established in approximately 25-30 years. The percentage of permanent barren and sparsely vegetated land would be reduced to approximately 40- 50%.

Under the Proposed Action, 115 acres of additional mining disturbance are projected by 1998, and 80 of these acres would be reclaimed. Projected mining activity would probably be concentrated in the upper tributaries of Beaver Creek, especially in Nome, Champion, Bear, and Quartz Creeks. Roads into the area from Nome Creek would result in 202 acres of barren ground, and new trails an additional 76 acres of disturbance to vegetation. Using the calculations discussed in Appendix D-1, 28 acres would regrow to a riparian tall shrub community within 25 years of reclamation, an additional 23 acres would revegetate within 50 years on mining disturbance in creek bottoms, and 64 acres of new mining disturbance would remain barren or sparsely vegetated.

The road would remain barren indefinitely, removing 202 acres of upland vegetation. The probable route of this road generally transects stands of mature deciduous forest, sparse black spruce with willow patches, low and dwarf shrub tundra, and sparsely vegetated alpine tundra. New trails in the area will impact 76 acres of the watershed. Vegetation is not totally removed, but other impacts would include ponding of water in low areas, compaction of soils, and vegetational changes in the disturbed areas along the site.

4.5.2 Alternative A

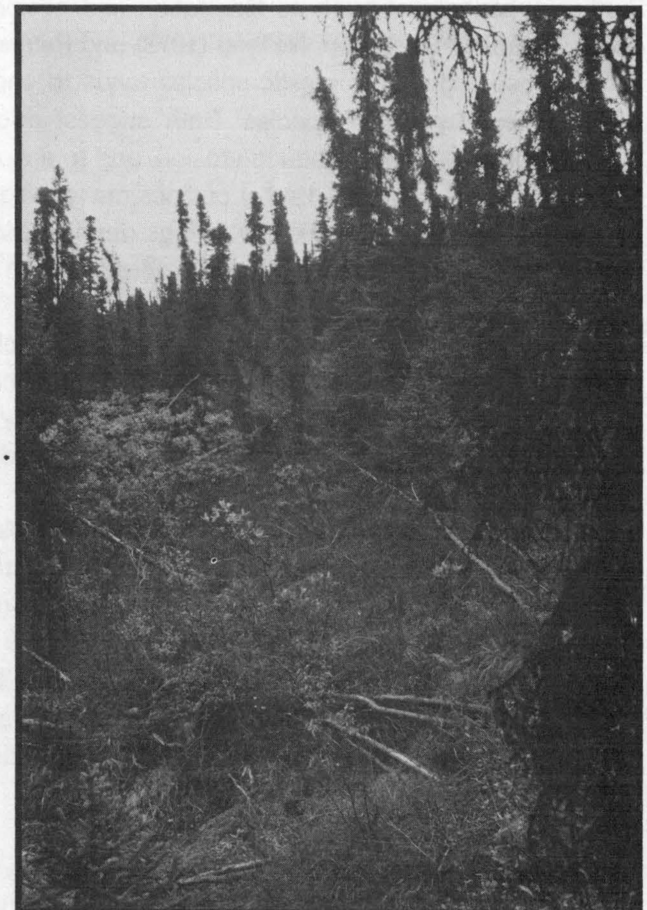
Reclamation for this alternative does not require saving or respreading available topsoil over the tailings. The lack of fine materials in the reclaimed tailings would retard rapid regrowth of vegetation. Regrowth to a stable, sustaining, productive community of tall shrubs would take approximately 50 years (Figure 4-2). Under this alternative 70 acres would be reclaimed, with regrowth on these areas similar to areas of unreclaimed washplant tailings that haven't been respread with stockpiled topsoil and overburden.

Under Alternative A, 100 acres of mining disturbance is expected by 1998. Projected mining activity would probably be concentrated in the upper tributaries of Beaver Creek, especially in Nome, Champion, Bear, and Quartz Creeks. Roads into the headwater drainages from Nome Creek would result in 176 acres of barren ground with new trails adding an additional 66 acres of disturbance to vegetation. A riparian tall shrub community would regrow on 12 acres within 30 years of reclamation, an additional 7.5 acres within 50 years would regrow on mining disturbance in creek bottoms, and 80 acres of new mining disturbance would remain barren or sparsely vegetated.

The roads would remain barren indefinitely, removing 176 acres of upland vegetation. The probable route of this road generally transects stands of mature deciduous forest, sparse black spruce with willow patches, low and dwarf shrub tundra, and sparsely vegetated alpine tundra. New trails in the area would impact 66 acres of the watershed. Vegetation would not be totally removed, but other impacts include ponding of water, compaction of soils, and a change in the composition of the original vegetation community on the site.

4.5.3 Alternative B

Alternative B would require saving and respreading available topsoil and overburden over the tailings. The approximate rate of regrowth on old dredged tailings for this alternative would be approximately 50 years. Mining on new ground would have fine grained overburden and organic material available for reclamation, allowing regrowth to a tall shrub community in approximately 30 years.



Typical north-facing unmined sideslope consisting of black spruce, willow, and sphagnum moss.

Under Alternative B, an additional 100 acres of mining disturbance is expected by 1998. Projected mining activity would probably be concentrated in the upper tributaries of Beaver Creek, especially in Nome, Champion, Bear, and Quartz Creeks. Roads into the area of projected mining from Nome Creek would result in 176 acres of barren ground, with new trails adding an additional 66 acres to disturbance. Using the calculations discussed in Appendix D-1, 25 acres would regrow to a riparian tall shrub community within 30 years of reclamation, an additional 7.5 acres would regrow on mining disturbance in creek bottoms within 50 years, and 67 acres of mining disturbance would remain barren or sparsely vegetated.

The road would remain barren indefinitely, removing 176 acres of upland vegetation. The probable route of this road generally transects stands of mature deciduous forest, sparse black spruce with willow patches, low and dwarf shrub tundra, and sparsely vegetated alpine tundra. New trails in the

area would impact 66 acres of the watershed. Vegetation would not be totally removed, but other impacts include ponding of water, compaction of soils, and a change in the composition of the original vegetation community on the site.

4.5.4 Alternative C

Alternative C would require that topsoil and overburden be saved and respread over contoured tailings. With the mining in old tailings, another source of fine materials is necessary to facilitate natural revegetation on the site. One possible source would be fines from the abandoned settling ponds. Further enhancement such as fertilization and seeding may be required by BLM in approving individual Plans of Operation. Neiland (1978) and Peterson and Peterson (1977) point out that fertilization and seeding with domestic species tends to encourage non-native species at the expense of establishment by native species. Both suggest a combination of techniques to facilitate quick regrowth of vegetation to reduce erosion, and to enhance eventual establishment of a community of native plants. Mowatt (DOI 1987e) outlines many mitigation techniques for preparing soils, as well as considerations for revegetation of tailings during reclamation. The details of such work would have to be site specific, and specified in the individual Plan of Operation for the mine.

On a site where a variety of techniques are used, including mixing of settling pond fine materials in the tailings, fertilization, seeding, and mulching to enhance regrowth, a stable, sustaining community of tall shrubs would be established in approximately 25-30 years. The percentage of permanently barren and sparsely vegetated land would be reduced to approximately 40-50%.

Under Alternative C an additional 84 acres of mining disturbance would be expected by 1998. Projected mining activity would probably be concentrated in the upper tributaries of Beaver Creek, especially in Nome, Champion, Bear, and Quartz Creeks. A road into the area from Nome Creek would result in 148 acres of barren ground, with new trails adding an additional 55 acres to vegetation. Using the calculations discussed in Appendix D-1, 21 acres would regrow to a riparian tall shrub community within 25 years of reclamation, an additional 16.5 acres will regrow on mining disturbance in creek bottoms within 50 years, and 47 acres of new mining disturbance would remain barren or sparsely vegetated.

The road would remain barren indefinitely, removing 148 acres of upland vegetation. The probable route of this road generally transects stands of mature deciduous forest, sparse black spruce with willow patches, low and dwarf shrub tundra, and sparsely vegetated alpine tundra. New trails in the area would impact 55 acres of the watershed. Vegetation would not be totally removed, but other impacts include ponding of water, compaction of soils, and a change in the composition of the original vegetation community on the site.

4.5.5 Alternative D

Under this alternative there would be no further mining on federal claims in the watershed. The rate of regrowth would be very similar to Alternative A, with the existing disturbance becoming revegetated by natural processes. Most existing old tailings would not be reclaimed because there would be no further mining in those gravels. There would be no impacts from other mines, because there are no mines on State or private lands in the watershed.

Under Alternative D, no additional acreage of mining disturbance would be expected by 1998, but 300 acres of past dredge tailings will remain barren or sparsely vegetated. The road will remain barren indefinitely, removing 43 acres of upland vegetation. Existing trails affect 85 acres. Vegetation is not totally removed on trails, but other impacts include ponding of water, compaction of soils, and a change in the composition of the original vegetation community on the site.

4.5.6 Special Considerations

Cumulative Impacts

Total cumulative impacts to landcover consist of past and current impacts in addition to those impacts discussed under each alternative. Some acreage that has been placer mined does not regrow vegetation, but remains barren or sparsely vegetated for a long time. Vegetation is also destroyed in areas of roads, and does not regrow as long as the roads are in use. In the Nome Creek, dredge tailings, 300 of 350 acres disturbed remain barren or sparsely vegetated over 40 years after mining. The mining activity of 1987 was in an area of previously disturbed floodplain, and is estimated to result in 2.5 acres of barren or sparsely vegetated land.

Under the Proposed Action, a total of 566 acres would remain barren or sparsely vegetated after a regrowth period of 25 to 30 years. Alternative A would result in a total of 556 acres barren after 50 years, under Alternative B, 544 acres would remain barren after 30 to 50 years, under Alternative C, 495 acres after 25 to 30 years, and under Alternative D, 343 acres of historic surface disturbance would remain barren or sparsely vegetated.

Unavoidable Adverse Impacts

During mining operations, the vegetation cover is destroyed in the areas of the mine and roads. There would be a long-term loss of the original riparian community, which would be replaced by an earlier successional community, and of soils, including permafrost, for 100-200 years. After regrowth of native vegetation, a portion of the mined area will remain barren or sparsely vegetated for a long period (over 90 years), resulting in an unavoidable loss of some vegetative resources. The Proposed Action and the alternatives would have cumulative unavoidable impacts which would be the total of acreage barren from past mining (300 acres), the acres disturbed from roads, and the acres disturbed from mining (Figure 4-1), for a period of 25-50 years until reestablishment of the tall shrub

community. Long-term unavoidable impacts would be the acreages which remain barren or sparsely vegetated after regrowth, as discussed in the section "Irreversible and Irretrievable Commitment of Resources".

Short- Term Uses vs Long-Term Productivity of Resources

The term "productivity", as used for vegetation, refers to the rate of biomass production, usually expressed as km/hectare/year. Early successional communities such as grass/forb stands often have higher rates of productivity than mature forest stands. The productivity of a mined site would be very low for several years (barren and sparsely vegetated), increase rapidly for 5 to 50 years after mining, then gradually begin to decrease as forest cover becomes reestablished.

Immediately following mining, the disturbed area would have almost no productivity for vegetation biomass. During the early stages of succession (sparse cover of grasses, forbs, and small shrubs), productivity gradually increases. The community of open tall shrubs of willow, birch, and balsam poplar, would have the same or higher productivity than that of the original riparian community on the site. Natural revegetation takes approximately 25-50 years after mining disturbance, with time frames dependent on the environmental factors and disturbance history of the sites (Figure 4-2). As succession proceeds toward mature deciduous or white spruce forest, productivity gradually declines. Short-term use vs long-term productivity of vegetation resources would be the same for all alternatives because the successional patterns would be similar, even though the rates of successional change may vary.

Irreversible and Irretrievable Commitment of Resources

One irretrievable loss would be the original riparian vegetation community with its associated organic soils and permafrost regime. This would be particularly true for areas along edges of the valleys or old terraces. These areas often support black spruce and shrubs with moss ground cover prior to mining. Time frames for reestablishment of these soils and corresponding vegetation types range from 100 to over 200 years. The irretrievable loss of the original riparian community with the organic soils and permafrost regime would be similar for all mining alternatives, because the mining actions which destroy the original soil structure and vegetation communities are the same for all mining alternatives.

Not all areas revegetate, and some may remain barren or sparsely vegetated for over 90 years after mining and reclamation are complete. The amount of ground remaining barren or sparsely vegetated depends on the proportion of fine grained materials in the reclaimed tails, and other site-specific factors. Under the Proposed Action, a total of 566 acres would be left barren or sparsely vegetated. The barren area includes 300 acres of tailings from past dredging, 64 acres from new mining, and 202 acres from all roads. This barren acreage would be an irretrievable and irreversible loss of vegetation resources. Alternative A would result in 556 acres remaining barren or sparsely vegetated, including 80 acres of new mining and 176 acres from all roads. Alternative B would leave 544 acres barren or sparsely vegetated, including 68 acres from new mining. Alternative C would

result in 495 acres remaining barren, including 47 acres from new mining and 148 acres from all roads. Alternative D would include acreage from past mining, a total of 343 acres barren and sparsely vegetated, including tailings from past dredging, and all roads.

4.5.7 Threatened and Endangered Plants

Within the Beaver Creek drainage study area there are currently no "listed or candidate" threatened or endangered plant species. There are plant species considered endemic by BLM. Candidate plant species are those being considered by the Fish and Wildlife Service for listing as threatened and endangered (Section 3.5.4). The existing surface management regulations, 43 CFR 3809.2-2(d), apply. Assessments of proposed development sites, which are required under all alternatives causing disturbance, help to eliminate impact upon threatened, endangered, or endemic plants and their habitats. Therefore the cumulative effects upon any endemic plant species would be similar for all alternatives.

BLM policy is to protect, conserve, and manage federally and State-listed Threatened and Endangered plant species and candidate plants, and to use existing BLM authority to further the purpose of the federal Endangered Species Act and similar State laws. The BLM will ensure that actions authorized, funded, or carried out will not jeopardize the continued existence of such species or result in the destruction or adverse modification of their critical habitats. Specifically, BLM will: 1) Evaluate information to determine the distribution, abundance, reasons for current status, and habitat needs for candidate species on BLM lands, and the significance of BLM lands and actions in maintaining those species. 2) Evaluate all information to determine whether it is adequate to make informed management decisions (BLM Manual Section 6840). Priority is given to species for which significant adverse impacts are anticipated or for which there is a high risk in not knowing population trends. The effectiveness of the initial habitat assessment for the Proposed Action is vital to the survival and conservation of these species. These mitigation measures apply to all alternatives.

Unavoidable Adverse Impacts

Any disturbance or impact upon endemic species constitutes undue degradation. However, at this time the potential unavoidable loss of endemic plant habitat due to mining in Beaver Creek watershed is unknown. It is beyond BLM's present capabilities to clear all proposed development sites of possible disturbance to endemic species because of incomplete site-specific studies.

Short-Term Uses vs Long-Term Productivity of Resources

It is difficult to evaluate Threatened, Endangered, or Endemic plant species for short or long-term productivity because once a species is disturbed it may well lead to extinction in that particular area. Because of the pre-action assessments there should be no short of long-term threats on the Beaver Creek watershed. Overall, the best management practice in this case is avoidance of the resource.

Irreversible and Irretrievable Commitment of Resources

There are no irretrievable or irreversible conditions threatening the species involved.

4.6 Wildlife

The degree of impact to wildlife habitat and populations resulting from mining-related activities depends on the location, timing, and frequency or extent of the activity. The format adopted to analyze and discuss the impacts of the Proposed Action and alternatives includes those factors common to all alternatives and those specific to the Proposed Action and each alternative.

Analysis Approach

For the purpose of this analysis, mineral development activities were broken down and categorized into components. The major action components used to assess the environmental consequences of the Proposed Action and Alternatives on wildlife resources were access, facilities, and operations (Figure 4-3).

ACCESS	FACILITIES	OPERATIONS
Type(s) of vehicle(s)	Number & size of structures	Type/amount of equipment
Materials transported	Size of pad(s)	Timing & duration of equipment operation
Location & length of route	Number, timing & duration of people present	Size of area stripped
Frequency of current route use	Type & amount of waste produced	Size of area mined
Frequency of future route use	How often waste is disposed of	Size of various stockpiles
		Settling basin number & size
		Size of other surface disturbance

Figure 4-3. The three major components and subcomponents of mineral development used to assess impact on wildlife by the Proposed Action and the alternatives.

Analysis of the effects of access considered the type of vehicle(s) involved, material(s) being transported, location and length of access route, and how often the route would be used in the present and future. Subcomponents considered under facilities include the number and size of structures; the size of pad(s); the timing, frequency, and duration of human activity; the type and amount of waste produced; and the frequency of waste disposal. Distinct aspects of the operation component included the type and number of equipment used, timing and overall duration of equipment use, size of the area to be stripped, size of the area to be mined, size of various stockpiles, number and size of settling basins, and the size of any other surface disturbances.

General Impacts

The general potential impacts from the access, facilities, and operation components on the wildlife resource are identified in Figure 4-4. The levels of impact for the Proposed Action and Alternatives were subsequently determined and are presented in detail in Sections 4.6.1 - 4.6.5.

ACCESS	FACILITIES	OPERATIONS
Direct (long term) habitat loss	Direct (long term) habitat loss	Direct (long term) habitat loss
Disturbance (short term)/ disruption	Disturbance (short term)/ disruption	Disturbance (short term)/ disruption
Increased (long term) harvest pressure	Removal (long term) of nuisance animals	Hazardous (long term) material spill
Potential (long term) increased habitat loss		

Figure 4-4. Potential impacts to wildlife from mineral development.

Potential impacts resulting from access include removal of wildlife habitat due to roads and trails, disturbance and/or disruption of wildlife movements and seasonal use areas due to vehicular traffic, increased hunting/trapping pressure and other recreation use, and habitat destruction because of new or improved access into remote areas.

The potential impacts resulting from the facilities component are elimination of wildlife habitat due to the construction of gravel pads for structures; disturbance or disruption to wildlife due to human activity associated with the facility; and the removal of grizzly bear, black bear, or other animals attracted to solid waste.

Impacts from the operations component would result in loss of wildlife habitat due to removal or covering of vegetation by stripping, making mine cuts, stockpiling, and for settling basins. Disturbance or disruption of wildlife would occur in the vicinity of the operation due to noise from machinery and other activities. There is the unpredictable possibility of spilling diesel fuel, a hazardous material, which would result in contamination and loss of vegetation.

The type of mitigation or management control necessary to alleviate impacts to wildlife resources depends on the type, extent, and overall magnitude of the impact. Measures to avoid, minimize or rectify, and replace wildlife resources that may be impacted by mineral development are presented in Section 4.12 and Figures 4-8 through 4-12 of this document.

4.6.1 Proposed Action

Access

Construction of approximately 33.4 miles of permanent gravel roads in the Beaver Creek watershed would result in the permanent loss of 202 acres of wildlife habitat in the Nome and Bear Creek drainages. The establishment and use of 21 miles of primitive roads and trails, in addition to per-

manent roads, could result in 35,820 acres of wildlife habitat subject to short-term periodic disturbance by vehicular traffic when wildlife such as moose, caribou, and others are present. The anticipated level of vehicular use of roads and trails would be low to moderate, and minimal alteration of wildlife movement routes or disturbance/disruption of seasonal use areas is anticipated.

Improvement and expansion of access trails into Quartz Creek, Bear Creek, and other areas of Beaver Creek would indirectly result in increased harvest pressure on moose, caribou, Dall sheep, grizzly bear, black bear and other species. Improving access or establishing new access for mining, recreation, and other activities into the area would indirectly facilitate more wildlife habitat loss and disturbance in wildlife use areas over the long term by enhancing the feasibility of mining and other human activities in more and larger areas.

Facilities

The increased presence of five mining camp facilities and structures associated with mining activities in Beaver Creek would result in the long-term loss of five acres of winter range for moose in the Nome, Bear, and Quartz Creek drainages. Similarly, 90 acres of riparian habitat used by moose and other species would be unavailable for the short-term due to frequent human disturbance near the facilities during May through October. The removal of grizzly or black bears as nuisance animals due to their attraction to refuse or other solid waste in the vicinity of mining facilities could occur.

Operations

Activities directly associated with stripping, mine cuts, stockpiles, and settling basins would result in physical alteration of about 110 additional acres of moose winter range in the Nome, Bear, and Quartz Creek valleys. Reclamation of this area would occur through spreading of tailings, fines, topsoil and fertilizing and reseeding/replanting with native species (as described in Section 2.3). Revegetation in previously undisturbed areas would take 25-35 years and revegetation in old tailings areas would take at least 50 years (Figure 4-2) to reach a stage suitable for moose browse. Short-term avoidance during the summer mining season of 2,420 acres of riparian and upland habitat in the Nome, Bear, and Quartz Creek areas may occur due to noise from machinery and other mining activities. The possibility of hazardous material spills such as diesel fuel exists, and could result in contamination or loss of wildlife habitat.

Conclusion

The effects of the Proposed Action are summarized in Figure 4-5. Approximately 676 total acres of wildlife habitat (primarily moose winter range) would be physically altered due to mining- related activities (including roads and facilities) in the Nome, Bear, and Quartz Creek areas of Beaver Creek. Periodic disturbances to wildlife due to use of roads and trails, operation of vehicles and machinery, and human habitation in the Beaver Creek watershed totaling 38,420 acres could result in a low to moderate level of short-term cumulative effects in localized areas, particularly during May through October. Minimum harvest of wildlife directly resulting from mining activities is anticipated in Beaver Creek. The principle long term adverse effect of mining in Beaver Creek would be the unavoidable loss (even with reclamation) of approximately 115 acres of the moose winter range in the Nome,

Bear, and Quartz Creek watersheds for up to a 25 to 50 year period. In addition, approximately 64 acres of the area would remain permanently barren or support only sparse vegetation after 50 years. The long-term cumulative loss of habitat to mining activities in these areas of Beaver Creek and adjacent State lands would probably contribute to a low-level reduction in moose population potential.

The potential exists for long term cumulative adverse effects to moose, caribou, Dall sheep, raptors, and other species if human use of the area increases greatly in crucial wildlife habitats. Additionally, the potential exists for a greater long-term loss of wildlife habitat from removal of vegetation due to a potential increase of mining activity in crucial wildlife habitats. The long-term cumulative effects of potential future disturbance/disruption and loss of habitat in crucial use areas could be significant, depending on the specific location, amount, and duration of the actions.

4.6.2 Alternative A

Access

Construction of approximately 29.1 miles of permanent gravel roads in the Beaver Creek watershed would result in the permanent loss of 176 acres of wildlife habitat in the Nome and Bear Creek drainages. The establishment and use of 18.3 miles of primitive roads and trails, in addition to permanent roads, could result in 31,340 acres of wildlife habitat subject to short-term periodic disturbance by vehicular traffic when wildlife such as moose, caribou, and others are present. The anticipated level of vehicular use on roads and trails would be low to moderate, and minimal alteration of wildlife movement routes or disturbance and disruption of seasonal use areas is anticipated.

Improvement and expansion of access trails into Quartz Creek, Bear Creek, and other areas of Beaver Creek would indirectly result in increased harvest pressure on moose, caribou, Dall sheep, grizzly bear, black bear, and other species. Improving access or establishing new access for mining, recreation, and other activities into the area would indirectly facilitate more wildlife habitat loss and disturbance in wildlife use areas over the long-term, by enhancing the feasibility of mining and other human activities in more and larger areas.

Moose

Facilities

The increased presence of four facilities associated with mining activities in Beaver Creek would result in the long-term loss of four acres of winter range for moose in the Nome, Bear, and Quartz Creek drainages due to the installation of mining camp facilities/structures. Similarly, 72 acres of riparian habitat used by moose and other species would be unavailable for the short term due to frequent human disturbance near the facilities during May through October. The removal of grizzly or black bears as nuisance animals could occur due to their attraction to refuse or other solid waste in the vicinity of mining facilities.

Operations

Activities directly associated with stripping, mine cuts, stockpiles, and settling basins would result in physical alteration of approximately 96 additional acres of moose winter range in the Nome, Bear, and Quartz Creek valleys. Reclamation of 70 acres would occur through stabilizing to prevent erosion and natural succession (as described in Section 2.3). Revegetation in previously undisturbed areas would take 30-50 years and revegetation in old tailings areas would take at least 50 years (Figure 4-2) to reach a stage suitable for moose browse. Short- term avoidance during the summer mining season of 2,000 acres of riparian habitat in the Nome, Bear, and Quartz Creek areas may occur due to noise from machinery and other mining operation activities. The possibility of hazardous material spills (diesel fuel) exists, and may result in contamination and loss of wildlife habitat.

Conclusion

The effects of Alternative A are summarized in Figure 4-5. Approximately 634 total acres of wildlife habitat (primarily moose winter range) would be physically altered due to mining related activities including roads and facilities in the Nome, Bear, and Quartz Creek areas of Beaver Creek. Periodic disturbances to wildlife due to use of roads and trails, operation of vehicles and machinery, and human activities in the Beaver Creek watershed totaling 33,348 acres would result in a low to moderate level of short-term cumulative adverse effects in localized areas, particularly during May through October. Minimum harvest of wildlife as a direct result of mining activities is anticipated in Beaver Creek. The principle long-term adverse effect of mining in Beaver Creek would be the unavoidable loss (even with reclamation) of approximately 100 acres of the moose winter range in the Nome, Bear, and Quartz Creek watersheds for a 30 to 50 year period. In addition, approximately 80 acres of the area would remain permanently barren or support only sparse vegetation after 50 years. The long term cumulative loss of habitat to mining activities in these areas of Beaver

Porcupine

Creek and adjacent State lands would probably contribute to a low-level reduction in moose population potential.

The potential exists for long-term cumulative adverse effects to moose, caribou, Dall sheep, raptors and other species if human use of the area increases greatly in crucial wildlife habitats. Additionally, the potential exists for a greater long-term loss of wildlife habitat (removal of vegetation) due to a potential increase of mining activity in crucial wildlife habitats. The long-term cumulative effects of potential future disturbance/disruption and loss of habitat in crucial use areas could be significant depending on the specific location, amount, and duration of the actions.

4.6.3 Alternative B

Alternative B is identical to Alternative A except that reclamation of 70 acres would occur through the spreading of tailings, fines, topsoil, and natural succession (as described in Section 2.3). Revegetation in previously undisturbed areas would take 30 to 50 years. Approximately 68 acres of the area would remain permanently barren or support only sparse vegetation after 50 years.

4.6.4 Alternative C

Access

Construction of approximately 24.4 miles of permanent gravel roads in the Beaver Creek watershed would result in the permanent loss of 148 acres of wildlife habitat in the Nome and Bear Creek drainages. The establishment and use of 15.3 miles of primitive roads and trails, in addition to permanent roads, could result in 26,412 acres of wildlife habitat subject to short-term periodic disturbance by vehicular traffic when wildlife such as moose, caribou, and others are present. The anticipated level of vehicular use of roads and trails would be low to moderate, and minimal alteration of wildlife movement routes or disturbance and disruption of seasonal use areas is anticipated.

Improvement and expansion of access trails into Quartz Creek, Bear Creek, and other areas of Beaver Creek would indirectly result in increased harvest pressure on moose, caribou, Dall sheep, grizzly bear, black bear, and other species. Improving access or establishing new access for mining, recreation, and other activities into the area will indirectly facilitate more wildlife habitat loss and disturbance in wildlife use areas over the long term by enhancing the feasibility of mining and other human activities in more and larger areas.

Facilities

The increased presence of three facilities associated with mining activities in Beaver Creek would result in the long-term loss of three acres of winter range for moose in the Nome, Bear, and Quartz Creek drainages due to the installation of mining camp facilities/structures. Similarly, 54 acres of riparian habitat used by moose and other species would be unavailable for the short term due to

frequent human disturbance near the facilities from May through October. The removal of grizzly or black bears as nuisance animals could occur due to their attraction to refuse or other solid waste in the vicinity of mining facilities.

Operations

Activities directly associated with stripping, mine cuts, stockpiles, and settling basins would result in physical alteration of approximately 58 additional acres of moose winter range in the Nome, Bear, and Quartz Creek valleys. Reclamation of the 80 acres would occur through the spreading of tailings, fines, topsoil, and fertilizing and reseeding to encourage regrowth of native species (as described in Section 2.3). Revegetation in previously undisturbed areas would take 25 to 35 years and revegetation in old tailings areas would take at least 50 years (Figure 4-2) to reach a stage suitable for moose browse. Short-term avoidance during the summer mining season of 1,500 acres of riparian and upland habitat in the Nome, Bear, and Quartz Creek areas will occur due to noise from machinery and other mining activities. The possibility of hazardous material spills (diesel fuel) exists and may result in contamination and loss of wildlife habitat.

Conclusion

The effects of Alternative C are summarized in Figure 4-5. Approximately 589 total acres of wildlife habitat (primarily moose winter range) would be physically altered due to mining related activities including roads and facilities in the Nome, Bear, and Quartz Creek areas of Beaver Creek. Periodic disturbances to wildlife due to use of roads and trails, operation of vehicles and machinery, and human habitation in the Beaver Creek watershed totaling 27,972 acres could result in a low to moderate level of short-term adverse effects in localized areas, particularly during May through October. Minimum harvest of wildlife as a direct result of mining activities is anticipated in Beaver Creek. The principle long-term adverse effect of mining in Beaver Creek would be the unavoidable loss (even with reclamation) of approximately 100 acres of the moose winter range in the Nome, Bear, and Quartz Creek watersheds for a 25-50 year period. In addition, approximately 47 acres of the area would remain permanently barren or support only sparse vegetation after 50 years. The long-term cumulative loss of habitat to mining activities in these areas of Beaver Creek and adjacent State lands would probably contribute to a low-level reduction in moose population potential.

The potential exists for long-term cumulative adverse effects to moose, caribou, Dall sheep, raptors and other species if human use of the area increases greatly in crucial wildlife habitats. Additionally, the potential exists for a greater long-term loss of wildlife habitat (removal of vegetation) due to a potential increase of mining activity in crucial wildlife habitats. The long-term cumulative effects of potential future disturbance/disruption and loss of habitat in crucial use areas could be significant depending on the specific location, amount, and duration of the actions.

4.6.5 Alternative D

Access

Approximately 7.2 miles of permanent gravel roads in the Beaver Creek watershed and associated permanent loss of 43 acres of wildlife habitat in the Nome Creek drainage would remain if Alternative D is implemented. The continued use of 23.3 miles of primitive roads and trails, in addition to existing permanent roads, may subject in 20,524 acres of widlife habitat to short- term periodic disturbance by vehicular traffic when wildlife such as moose, caribou, and others are present. The present low level of vehicular use of roads and trails would probably increase over time because of non-mineral development activities (recreation). No alteration of wildlife movement routes, or disturbance/disruption of seasonal use areas directly attributable to mining access would occur.

Recreation and other secondary use of the access trails into Quartz Creek and other areas of Beaver Creek would continue to result in increased harvest of moose, caribou, Dall sheep, grizzly bear, black bear, and other species. Improving access or establishing new access for mining activities would not occur.

Facilities

Mining facilities that have resulted in the long-term loss of two acres of winter range for moose in the Nome Creek drainage would be removed. Similarly, riparian habitat used by moose and other species would not be subject to mining facility-related human disturbance from May through October. The removal of grizzly or black bears as nuisance animals due to their attraction to refuse or other solid waste in the vicinity of mining facilities would not occur.

Operations

Past activities directly associated with stripping, mine cuts, stockpiles, and settling basins have resulted in physical alteration of approximately 352 acres of moose late winter range in the Nome Creek valley. Approximately 310 acres of this previously-mined habitat that has recovered over the last 40- 60 years now provides approximately 30-50 acres of usable browse for moose. This area would remain undisturbed. Approximately 40 acres of the previously-mined area which has been mined since 1984 has been reclaimed through the spreading of tailings and natural succession (as discussed in Section 2.3). Revegetation in this old tailing area will require at least 50 years (Figure 4-2) to reach a stage suitable as moose browse. Avoidance by animals of riparian habitat during the summer mining season in the Nome Creek area due to noise from machinery and other mining activities would not occur. Similarly, the possibility of hazardous material spills would not exist.

Conclusion

The effects of Alternative D are summarized in Figure 4-5. Approximately 300-320 acres of riparian habitat (primarily moose winter range) would remain permanently barren because of past physical alteration in the Nome Creek area of Beaver Creek. Past disturbances to wildlife from mining vehicles, machinery, and human habitation in the Beaver Creek watershed would cease. Recreation use of existing roads and trails would continue to facilitate increased harvest of wildlife. Although

Action Component/ Potential Impact		Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D
Permanent roads result in habitat loss	Extent	33.4 miles/202 acres	29.1 miles/ 176 acres	29.1 miles/176 acres	24.4 miles/148 acres	7.2 miles/43 acres
	Duration	Mine life & beyond	Mine life & beyond	Mine life & beyond	Mine life & beyond	Present, & beyond
	Frequency	Annually	Annually	Annually	Annually	Annually
Use of roads/trails can disrupt normal wildlife use patterns	Extent	54.4 miles/35,820 acres	47.4 miles/31,340 acres	47.4 miles/31,340 acres	39.7 miles/26,512 acres	30.5 miles/20,524 acres[1]
	Duration	6 months (May – Oct) All months for recreation	6 months (May – Oct) All months for recreation	6 months (May – Oct) All months for recreation	6 months (May – Oct) All months for recreation	All months for recreation
	Frequency	Intermittent	Intermittent	Intermittent	Intermittent	Intermittent
Use of roads/trails increases harvest	Extent	54.4 miles/35,820 acres	47.4 miles/31,340 acres	47.4 miles/31,340 acres	39.7 miles/26,512 acres	30.5 miles/20,524 acres[1]
	Duration	Mine life & beyond	Mine life & beyond	Mine life & beyond	Mine life & beyond	Present, & beyond
	Frequency	Annually	Annually	Annually	Annually	Annually
Potential upgrading of roads/ trails & more roads/ trails can increase habitat loss, disturbance & harvest	Extent	Unpredictable, but greater	Unpredictable, but greater	Unpredictable, but greater	Unpredictable, but greater	NO EFFECT
	Duration	Mine life & beyond All months for recreation	Mine life & beyond	Mine life & beyond	Mine life & beyond	
	Frequency	Annually	Annually	Annually	Annually	
Gravel pads etc. remove/ cover habitat	Extent	5 acres	4 acres	4 acres	3 acres	2 acres
	Duration	Mine life	Mine life	Mine life	Mine life	50 years[2]
	Frequency	Annually	Annually	Annually	Annually	Annually
Human habitation can cause disturbance/ disruption	Extent	90 acres	72 acres	72 acres	54 acres	NO EFFECT
	Duration	6 months (May – Oct)	6 months (May – Oct)	6 months (May – Oct)	6 months (May – Oct)	
	Frequency	Annually	Annually	Annually	Annually	
Improper solid waste disposal may attract nuisance animals	Extent	1 – 3 bears	1 – 3 bears	1 – 3 bears	1 – 3 bears	NO EFFECT
	Duration	6 months (May – Oct)	6 months (May – Oct)	6 months (May – Oct)	6 months (May – Oct)	
	Frequency	Annually	Annually	Annually	Annually	

[1] Due to recreation or other uses, not directly attributable to mineral development

[2] Reclamation will be conducted on areas previously disturbed with minimum fines available

CONTINUATION

Action Component/ Potential Impact		Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D
Stripping, mine cuts, stockpiles & roads remove/ cover habitat	Extent	115 acres	100 acres	100 acres	84 acres	40 acres
	Duration	25 – 35 years	50 years	30 – 50 years	25 – 35 years	50 years [2]
	Frequency	Annually	Annually	Annually	Annually	Annually
Operation of machinery can disrupt natural wildlife use patterns	Extent	2,510 acres	2,008 acres	2,008 acres	1,506 acres	NO EFFECT
	Duration	6 months (May – Oct)	6 months (May – Oct)	6 months (May – Oct)	6 months (May – Oct)	
	Frequency	Annually	Annually	Annually	Annually	
Hazardous material spills result in habitat loss	Extent	Unpredictable	Unpredictable	Unpredictable	Unpredictable	NO EFFECT
	Duration	25 – 35 years	50 years	30 – 50 years	25 – 35 years	
	Frequency	Unpredictable	Unpredictable	Unpredictable	Unpredictable	

[1] Due to recreation or other uses, not directly attributable to mineral development.

[2] Reclamation will be conducted on areas previously disturbed with minimum fines available

Figure 4 – 5. Summary and comparison of probable effects on wildlife resources in relation to the Proposed Action and alternatives.

there would be no further mining, unreclaimed areas disturbed by past mining will continue to result in the long-term unavoidable loss of 32- 34% of the previously disturbed moose late winter range in the Nome Creek watershed. The long term loss of habitat to mining in this portion of Beaver Creek will continue to contribute to a slight to low level reduction in moose population potential.

4.6.6 Special Considerations

Cumulative Impacts

Cumulative impacts to wildlife populations are primarily associated with habitat loss from past, current, and projected mining activity. Much of the past impact comes from loss of riparian vegetation in historically mined areas which have not been reclaimed, or from acreage used for roads. In the Nome Creek dredge tailings, 300 of 350 acres disturbed remain barren or sparsely vegetated over 40 years after mining. The mining activity of 1987 was in this area of previously disturbed floodplain, and is estimated to result in 2.5 acres of barren or sparsely vegetated land.

Under the Proposed Action, a total of 566 acres would remain barren or sparsely vegetated after a regrowth period of 25 to 30 years. Alternative A would result in a total of 556 acres barren after 50 years, under Alternative B, 544 acres would remain barren after 30 to 50 years, under Alternative C, 495 acres after 25 to 30 years, and under Alternative D, 343 acres of historic surface disturbance would remain barren or sparsely vegetated.

Unavoidable Adverse Impacts

Unavoidable short-term impacts occur from mineral development. Species that are sensitive to noise, odors, movement, and the presence of human activity are most affected by mining activities and will avoid areas where these actions occur. Construction and use of facilities, operation of mining equipment, and increased vehicular traffic for access result in an unavoidable adverse effect to wildlife. Mining roads and trails are generally not removed or closed to present or future public use. This situation facilitates an increase in human use of wildlife and other resources over the long term. Over the long term, the extent, frequency, and duration of the activities determine the degree of disturbance or disruption.

Natural recovery of wildlife habitat is slow in areas that have been disturbed by mineral development. Reclamation practices can enhance the recovery of wildlife habitat in disturbed areas; nevertheless, the affected habitat may be lost for 25 to 50 years. The principal habitats that are unavoidably lost, for these periods of time are the riparian habitats that are especially important to moose as winter range. Furthermore, previously-mined areas that are subjected to additional, new mining are the principal source of permanent habitat loss because fines and other basic soil components are not available for use in reclamation. It is possible for localized extirpation or reduction beyond minimum viable population levels to occur if the overall extent of habitat loss is large and the duration is long- term.

The potential for an overall increase in the level of cumulative impacts on wildlife and habitat exists. This could occur because of the accumulation of small, apparently insignificant, residual impacts to wildlife resources over time. This unavoidable impact could become substantial over the long-term if conflicts between wildlife values, mineral development, increased visitor use, and a greater demand for human use of the wildlife resource are not adequately mitigated.

Short- Term Uses vs Long-Term Productivity

The long-term productivity of wildlife habitat subject to mineral development activities would depend on 1) the extent and timing of mineral development activities, 2) the success of mitigative measures or management controls to minimize the alteration and disturbance of normal wildlife use patterns, and 3) the successful reclamation of habitat that has been physically altered, removed, or lost.

Short-term use of certain sites for mining may ultimately result in long-term changes in vegetation composition and increase productivity of the site for some species. For example, sites underlain by permafrost with black spruce and few willows present are relatively unproductive as moose winter range. Over the long term, physical alteration by mining activities and reclamation of the site may result in more willows available for moose as winter browse.

Even the successful implementation of management controls to avoid, minimize, or replace lost habitat cannot prevent the possibility of a reduction in the long-term opportunity for increasing the potential moose population in the area. The area has supported a larger population of moose in the past and the existing habitat has the potential to support a larger population (the present moose population is not at carrying capacity). The loss of existing moose habitat, especially late winter range, due to mineral development activities would reduce carrying capacity and could compromise the ADF&G management goal to increase the moose population over the long term. The potential for optimal numbers of moose would be lowered because the habitat carrying capacity would have been lost or reduced due to mineral development. The degree of impact to the moose population potential in the region due to mineral development would depend on the overall extent and duration of the habitat loss.

Irreversible and Irretrievable Commitments of Resources

Wildlife and habitat are renewable resources over the long term. If the mitigative measures designed to avoid, minimize, and monitor the adverse effects and to replace habitat physically altered by mineral development were fully and successfully employed, there would be little irreversible or irretrievable commitment or permanent loss of wildlife habitat over the long term. Previously-mined areas that are subjected to additional, new mining are the principal source of permanent habitat loss because fines and other basic soil components are not available for use in reclamation.

4.6.7 Threatened and Endangered Animals

Impacts Common to All Alternatives

The Proposed Action and alternatives are anticipated to have no effect on the endangered peregrine falcon. Each operator is required to take such action as may be needed to prevent adverse impacts to threatened or endangered species, 43 CFR 3809.2-2(d).

Protective Measures

Each proposal to conduct mining activities is evaluated by BLM on a case-by-case basis for potential conflicts with the peregrine falcon. As a result, the recommended protective measures of the Peregrine Falcon Recovery Plan (USFWS 1982), informal consultation with the USFWS, or formal consultation with the USFWS may be employed by BLM, if necessary. The standard mitigation or protective measures recommended by the USFWS are:

Within one mile of nest sites:

1. Require aircraft to maintain minimum altitudes of 1500 feet above nest level from April 15 through August 31.

2. Prohibit all ground level activity from April 15 through August 31, except on existing thoroughfares.

3. Prohibit habitat alterations or the construction of permanent facilities.

Within two miles of nest sites:

1. Prohibit activities having high noise levels from April 15 through August 31.

2. Prohibit permanent facilities having high noise levels or sustained human activity, or the altering of limited, high quality habitat (e.g., ponds, lakes, wetlands, and riparian habitats).

Within 15 miles of nest sites:

1. Prohibit alteration of limited, high quality habitat which could detrimentally and significantly reduce prey availability. Of particular concern are ponds, lakes, wetlands, and riparian habitats.

2. Prohibit use of pesticides; the only exception may be limited non-aerial application of approved non-persistent insecticides at supply bases.

Unavoidable Adverse Impacts

No unavoidable adverse impacts are anticipated to result from implementation of the Proposed Action or the alternatives.

Short-Term Uses vs Long-Term Productivity

No adverse impact to the long-term productivity of the peregrine falcon is anticipated to result from implementation of the Proposed Action or the alternatives.

Irreversible and Irretrievable Commitments of Resources

No irreversible or irretrievable commitment or permanent loss of Peregrine falcon habitat is anticipated to result from implementation of the Proposed Action or the alternatives.

4.7 Fisheries

Placer mining may adversely affect aquatic systems directly through habitat disruption or physical alteration, and indirectly through point and non-point discharges of waste waters (Figure 4- 6). Direct impacts to the aquatic community include the destruction of instream habitat, disruption of riparian zones. Indirect impacts to the aquatic community result from increased levels of trace metal contaminants, increased turbidity and suspended sediment, increased levels of settleable solids, increased imbeddedness of stream substrates, decreased food supply for fish, long-term changes in channel configuration, and long-term disruption of riparian habitats. The overall severity of these effects on aquatic communities depends on their magnitude, frequency, and duration.

Effects on Aquatic Habitats

Several studies have addressed the effects of placer mining on chemical water quality of affected streams. In some cases, levels of trace metals like arsenic, cadmium, copper, lead, mercury, and zinc exceeded drinking water and aquatic life protection standards. Dames and Moore, et al. (ADEC et al. 1986) provide a summary discussion of these data. The general conclusion by all studies is that concentrations of certain trace metals were increased below mining activity. The increased total concentrations of trace metals below mining activity may pose a threat to aquatic animals if a significant portion of the total recoverable metals dissolve and are biologically available. There is a positive relationship between total recoverable and dissolved fractions of the metals. Therefore, it follows that reductions in sediment inputs from mining could substantially reduce metals concentrations in the affected streams (ADEC 1986, LaPerriere et al. 1985).

The biological significance of this conclusion is complicated by several factors. The sensitivities of arctic grayling and other organisms are not well known, the speciation of some of the metals is not known, the degree of tolerance of the local organisms is unquantified, and the proportion of metals that is biologically available versus that which is totally recoverable is unknown. All of these uncertainties contribute to the difficulty of assessing the biological significance of these data.

Increases in total suspended sediment (TSS) levels in streams with placer mining and in receiving waters downstream are the most significant impacts of mining activity (Bjerklie and LaPerriere 1985, Dames & Moore 1976, ADEC et al. 1986, LaPerriere et al. 1985, Mack et al. 1987, Mathers et al.

1981, Simmons 1984, Van Nieuwenhuyse and LaPerriere 1986, Wagener and LaPerriere 1985, Weber and Post 1985). Many studies document increases in suspended sediment concentrations of several orders of magnitude over background levels as a result of placer mining. The degree or magnitude of increase is highly variable and depends on regional geology, type of mining operation, and effectiveness of waste water treatment.

	DIRECT EFFECTS	INDIRECT EFFECTS
Actions which physically alter the Aquatic Habitat	Loss of Instream Habitat	Straight\monotypic stream channel Increased water velocity Decreased pools
	Loss of Streamside (Riparian) Habitat	Unstable banks Decreased temperature control Decreased detrital nutrient input Decreased debris recruitment
	Creation of Migration Barriers	Decrease in suitable habitat
Discharge of Wastewater	Increased Suspended Sediment/Turbidity	Increase trace metals Decreased light penetration, which leads to decreased primary production Decreased incubation and rearing suitability for fish Decreased incubation and rearing suitability for aquatic insects Interference with fish migration, which leads to decreased available habitat Decreased opportunity for recreational fishing
	Increased Settleable Solids/Sediment	Decreased aquatic insect density, biomass, diversity which leads to decreased fish food supply Increased stream substrate imbeddedness Increased smothering of incubating eggs

Figure 4-6. Direct and indirect effects of physically altering the aquatic habitat and the discharging wastewater.

Placer mining affects the physical habitat in a stream through destruction of the channel, and removal of the organic overburden of the banks and riparian zone adjacent to the stream. The post-mining stream channel is usually straight and the streams usually flow along bedrock with no meanders or pools resulting in a higher gradient with higher water velocity. These are often barriers to fish passage in these straightened streams. Migratory blocks may be physical barriers (e.g., settling pond dams) or functional blocks to fish passage, such as high water velocity, low water levels, or high TSS levels.

The disruption of riparian habitat along the stream is a major impact from placer mining. This riparian habitat is important for bank stabilization, detrital nutrient input, temperature control, and debris recruitment. Weber and Post (1985) reported mined areas over 60 years old where riparian

vegetation covered only 25% of the banks. As with reestablishment of the channel morphology, the regeneration of the riparian vegetation requires long periods in the subarctic environment. These processes can be expected to take in excess of 100 years on unreclaimed streams. These unavoidable impacts of placer mining on the aquatic system are typically long-term, and may remain even with reclamation measures.

Effects on Aquatic Populations

Light penetration is crucial to primary production in aquatic ecosystems. Turbid conditions that reduce light penetration will reduce primary productivity. In turn, the effects of reductions in primary productivity are transmitted up the food chain and can ultimately result in reduced populations of fish and their prey organisms.

The general lack of streamside forest or canopy cover over some subarctic streams suggests that these streams may be highly dependent on instream productivity to support the higher lifeforms present in them. Reductions in primary productivity could lead to reductions in biomass of aquatic invertebrates and ultimately to reductions in fish biomass, at least in the higher elevation headwater areas. Destruction of the riparian vegetation along forested streams also reduces carbon inputs from leaf litter.

Sediment and/or turbidity adversely effects aquatic invertebrate density, biomass, and diversity (EIFAC 1965, Mathers et al. 1981, Lloyd 1985, Wagener and LaPerriere 1985, Weber and Post 1985, Chapman and McLeod 1987). Studies demonstrate that increasing suspended and deposited sediment can lead to smothering and reduced respiratory efficiency of aquatic insects, abrasion, interference with filter feeders and net spinners, reduced food resources for grazers, cementing or increases in imbeddedness, and filling of crevices among larger cobbles. All of these actions result in habitat alterations that make the stream unsuitable for many species of aquatic organisms.

Weber and Post (1985) made comparisons of invertebrate populations above and below mining activity and compared unmined versus previously mined streams. In all cases, average densities of invertebrates decreased at sites below mining activity when compared to upstream controls. In many cases, whole families and one entire order (*Trichoptera*, caddis flies) disappeared below mining. In streams which had experienced previous mining activity, invertebrate densities were about 37% lower than unmined streams. In streams below active mining, invertebrate densities were reduced by nearly 90% compared with control stream segments.

The effects of reduced food supply and therefore reduced fat storage on overwinter survival and long-term fitness may be an important effect of placer mining on fish populations. It is possible that even if grayling were able to survive the summer in water heavily loaded with suspended sediments that they would be unable to store the same fat reserves accumulated by fish in clearwater areas. Therefore, they could be adversely affected in their overwinter survival, hampered in their upstream migration to spawning areas in the spring, and/or may be less able to produce viable gametes for successful reproduction. Overall, this could lead to a lower reproductive fitness of these fish populations and could lead to their possible elimination over time.

Numerous studies have been conducted to assess the effects of fine sediments on fish populations. Direct effects of suspended sediments on fish begin to be observed somewhere in the range of 50 to 100 mg/l (Herbert and Merkens 1961, EIFAC 1965, Noggle 1978, Berg 1982, McLeay et al. 1983, 1984, Simmons 1984, Lloyd 1985, Chapman and McLeod 1987, McLeay et al. 1987). EIFAC (1965) determined that no adverse effects of suspended sediments were demonstrated on fish at or below 25 mg/l. They further concluded that good to moderate fisheries could be expected with suspended sediment concentrations between 20 and 80 mg/l. At concentrations above 80 mg/l it was considered unlikely that good fisheries could be maintained, and about 400 mg/l, only poor fisheries were to be expected.

McLeay et al. (1983, 1984, 1987) conducted an extensive series of experiments concerning the effects of sediments from placer mining on Arctic grayling. They found lethal and sublethal effects from acute exposure at concentrations of 50,000 to 250,000 mg/l and chronic exposure up to 1,000 mg/l. Chronic exposures for six weeks to concentrations greater than 100 mg/l impaired feeding, caused reductions in growth rates, showed changes in coloration, and caused downstream displacement of experimental fish. Stress, as measured by changes in blood chemistry, was reported in fish exposed for short periods to sediment concentrations as low as 50 mg/l. It was noted that downstream displacement and the resultant decrease in suitable habitat were of particular concern in maintaining healthy fish populations in streams exposed to placer mining.

Investigations have been conducted to determine the effects of placer mining on grayling distribution (Mathers et al. 1981, Weber and Post 1985, ADEC 1986). In two of these studies (Weber and Post 1985, ADEC 1986), fish were found in clear water tributaries of mined streams and in unmined streams but none were found in streams affected by mining. Mathers et al. (1981) found adult grayling in almost all streams they sampled but no juvenile fish were found in three streams heavily affected by mining. Mathers et al. found adult grayling in suspended sediment concentrations as high as 4,453 mg/l. However, they were unable to determine if these fish were residing in these conditions or were moving downstream to escape the high sediment loads. In one stream with suspended sediment concentrations over 7,000 mg/l no grayling were found. Yet, miners have often noted an abundance of grayling in areas of direct mining discharge (Pacific Legal Foundation 1988).

Sediment impacts to incubating eggs may have been the cause for the absence of grayling fry in three streams sampled by Mathers et al. (1981). Grayling broadcast their eggs over gravel or other substrates making no effort to produce a redd as is common with trout and salmon (Reed 1964). Eggs exposed on the surface of the substrate are susceptible to smothering by sediment deposition from mining activities. This effect may have contributed to the apparent lack of spawning success noted by Mathers et al.

Physical disturbance of stream channels may be another factor that affected grayling distribution (ADEC et al. 1986). Data suggests that long reaches of disturbed channels with potential passage barriers restricts migration into some clearwater tributaries and therefore affects access to available habitat in some river basins. This could adversely effect the ability of a basin affected by mining to support a grayling population.

4.7.1 Proposed Action

Concentrations of arsenic, copper, lead, mercury, or other trace metals would increase in areas below mining activities. The biological significance of the increased metals concentrations is unknown. The magnitude of the increase will be a function of geology at mine sites, type of mining operation and effectiveness of wastewater treatment.

Mining operations will increase the total suspended sediment downstream from affected areas. The magnitude of impacts from increased suspended sediment and increased turbidity will be a function of geology at the mine sites and effectiveness of wastewater treatment.

Bjerklie and LaPerriere (1985) documented reduced hydraulic connection between surface and subsurface waters as an indirect effect of sediment on groundwater. The result of increased sediment in these circumstances is a lowering of the groundwater below the stream and a significant reduction in dissolved oxygen in mined streams. This condition could result in a reduction in overall quantity and quality of overwintering habitat and has been known to be directly harmful to fish eggs and aquatic insect larvae that are present in the substrate materials.

The direct effects of mining operations will be habitat degradation due to physical alteration and possible temporary blockage of fish migration. The physical alteration at the mines will also result in the loss of riparian vegetation which, under normal conditions, provides bank stability, instream cover, temperature control, and detrital nutrient input.

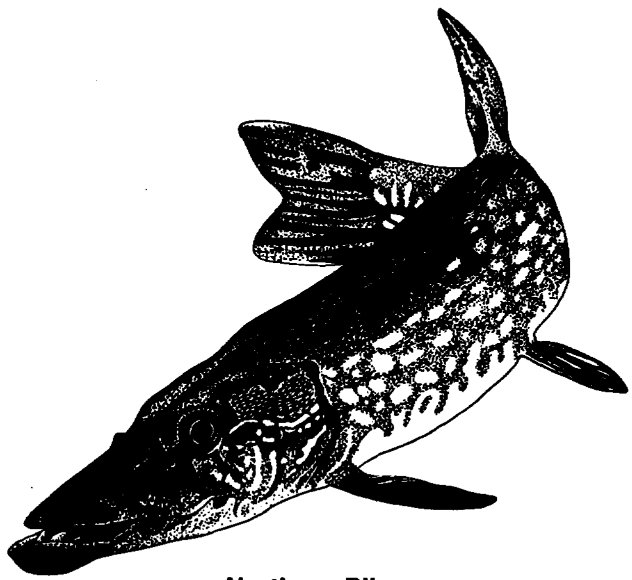
Mining activities will reduce primary productivity in areas affected by increased suspended sediment and turbidity. The magnitude of reduction of primary productivity will be a function of geology at the mine sites and effectiveness of wastewater treatment.

The average density (abundance) and diversity of aquatic insects will be decreased below mining activities. The magnitude of the impact on aquatic insects will be a function of total suspended sediment concentrations. These concentrations are, in turn, a function of geology at the mine sites and the effectiveness of wastewater treatment.

Stream segments directly affected by mining operations are not expected to support arctic grayling or other species. However, clearwater tributaries and other areas in the basin would continue to support all age classes and sizes, including fry, of grayling and other species. The overall magnitude of adverse affect to fish populations is not possible to determine. The combined effect of the mining operation will at least partially eliminate grayling from the mined reaches of the stream. The magnitude of the impacts to fish populations would probably be a function of the extent of migration blockages due to physical barriers and/or sediment concentrations, and the extent of rearing habitat lost. Habitat suitability in the streams affected by mining will be poor due to increased toxic metals concentrations, reduced food supply, reduced cover and refuge habitat, and reduced visibility for feeding. Spawning habitat in unaffected streams is expected to provide some recruitment for the affected areas if they remain accessible to fish, and if the habitat is suitable for rearing.

Conclusions

Physical alteration and increases in suspended sediment from multiple mines in the basin constitute a cumulative effect on the aquatic resources. Approximately one and one quarter miles of physical disturbance would occur in the upper basin of Beaver Creek. If the streams are functionally blocked to access for fish by the disturbance, the total affected area would increase because of their exclusion from clearwater areas upstream of mining activity. Some of the projected mining activity will probably be in areas previously dredged. Reclamation of the bypass may improve previously disturbed fish habitat over the long term. The overall cumulative effect of total suspended sediment increases in Beaver Creek cannot be determined. These effects would be a function of geology at individual mine sites and effectiveness of wastewater treatment.



Northern Pike

The reclamation standards will result in fairly rapid regrowth of the riparian vegetation (25-30 years), and reduce the amount of non-point sedimentation. The standards require rebuilding the stream channel in the original floodplain with pools, riffles, boulders, and approximately the original gradient. This replacement of habitat will minimize the long-term impacts to fish habitat. Areas that are remined in old dredged tailings will result in enhanced fish habitat after reclamation of the current bypass.

The duration or persistence of effects on aquatic resources will be a function of magnitude of habitat disruptions, the recovery of physical habitat and recolonization by fish and aquatic insects. Aquatic invertebrate populations exhibit rapid recolonization because most of these organisms use an aerial adult stage (fly) for dispersion and propagation if there is suitable instream and streamside habitat present. Restoration of the river/stream channel to approximate natural conditions is the situation most suitable for recovery and recolonization of aquatic resources.

4.7.2 Alternative A

Effects on the fish habitat from water quality changes are about the same as for the Proposed Action. Impacts could be less because there are no EPA variances as are allowed under the Proposed Action. Some detectable increase in the sediment load and turbidity of the mined streams would result during the production phase of the operations; however, this increase and accumulation of sediment could not be detectable in the fish habitat downstream because of the amount of dilution and large amounts of sediment transported during spring breakup. Trace metal concentrations would probably be less than under the Proposed Action with the magnitude of impact dependent on geology of mine site, type of operation, and effectiveness of wastewater treatment.

Cumulative impacts are similar as outlined for the Proposed Action. The degree of impact depends on the assumption that all federal mining operations will meet water quality performance standards as described in Chapter Two. There would be no significant impact on the Beaver Creek fishery under Alternative A if mining continues as in 1987 and standards are strictly adhered to.

There would be four placer mines, with disturbance along one mile total of stream, scattered in Nome, Quartz, Bear and/or Champion Creeks. Some areas may be remined, and reclamation requiring stabilization of the stream bypass may enhance previously disturbed fish habitat. In areas of mining in previously unmined streambed, the stream would be channeled into a bypass. This would reduce fish habitat as bypasses are generally straight, with no pools, and a faster velocity than the original stream channel.

4.7.3 Alternative B

Impacts from Alternative B would be very similar to those listed under Alternative A. The four mines will also impact approximately one mile of stream. The enhanced reclamation standards for Alternative B will probably increase the rate and amount of revegetation along the riparian zone. This will decrease the sedimentation from non-point erosion, and increase the bank stability, instream cover, temperature control, and detrital nutrient impact.

4.7.4 Alternative C

Three mining operations are projected to operate with the performance standards outlined for Alternative C. Operations that meet the water quality standards will result in minimal contribution of sediment or increased turbidity to the streams. The reclamation standards will result in more rapid regrowth of the riparian vegetation (25-30 years), and reduce the amount of non-point sedimentation. The three mines will disturb approximately .75 mile of stream channels, resulting in a short-term loss of fish habitat. The standards require rebuilding the stream channel in the original floodplain with pools, riffles, boulders, and approximately the original gradient. This replacement of habitat will minimize the long-term impacts to fish habitat. Areas that are remined in old dredged tailings will result in enhanced fish habitat after reclamation of the current bypass.

4.7.5 Alternative D

There will be no further impact on the fishery resources because there would be no additional mining to cause surface disturbance. Some erosion and turbidity could occur from past mining disturbance where reclamation has not been conducted. Also, increased turbidity would occur where reclamation is taking place on areas disturbed from mining since 1981. Fish habitat enhancement on Nome Creek, in conjunction with recreation, is an opportunity in this alternative.

4.7.6 Special Considerations

Cumulative Impacts

Total cumulative impacts to fisheries resources consist of past and current impacts in addition to those impacts discussed under each alternative. Impacts to fisheries are long term impacts of habitat degradation through alternative of the stream channel, and short- and long-term impacts from changes in water quality. Historic mining in the area has disturbed approximately nine miles of the streambed of Nome Creek. The mining activity of 1987 was in this area of previously disturbed floodplain. Mined reaches of Nome Creek are generally characterized by straight, shallow, high velocity, and frequently split stream stream channels with unstable banks and with minimal streamside vegetative cover.

Future mining in previously mined areas may result in reclamation of portions of this stream channel under the Proposed Action and Alternative C. Length of disturbed stream channel under each alternative is discussed in Section 4.3, Water Resources. Quantitative cumulative effects on fish populations are difficult to assess due to lack of historic data on fish populations in the watershed. Relative cumulative impacts of the alternatives, in decreasing order of impact (miles of fish habitat degradation and stream bank stability) are: Alternative C, Proposed Action, Alternative D, Alternative B, and Alternative A.

Unavoidable Adverse Impacts

Placer mining unavoidably results in a short to long-term loss of instream habitat, fish, and aquatic insects in areas of active mining. Effects on the downstream habitat from sediment increases on the channel and stream bed can be detrimental to fish populations. Also sport fish opportunities would be reduced because of increased turbidity in those stream sections below mining. These sport fish opportunities will become available once the mining operation closes down and the site is successfully rehabilitated.

New mining in the headwater streams of Beaver Creek would increase land disturbances and increase turbidity from seasonal runoff. These new operations could produce increased sediment downstream from mining operations along with any ongoing mining activities. Channel changes which destroy desirable fish habitat in the vicinity of the disturbed areas could preclude fish uses.

Short- Term Uses vs Long-Term Productivity

The long-term productivity of fish habitat would depend on the extent and timing of the mining development, adherence to performance standards, success of reclamation efforts where the habitat has been physically altered, and mitigation used.

Some short-term use that affects the long-term productivity are losses of desirable habitat and degradation of water quality from channel changes, increased channel gradients, degradation at the upper end of the mine disturbance, and sedimentation of stream substrate.

Occasionally, failure of water control structures, and runoff from access road construction creates sediment discharge into the fish habitat. Introduction of sediment into the stream environment will occur during spring breakup and floods. Adherence to performance standards and mitigation measures would help alleviate these short-term problems.

Irreversible and Irretrievable Commitment of Resource

There would be no irreversible or irretrievable commitments of the fishery resources if mitigation measures are followed and performance standards are adhered to.

4.8 Cultural Resources

4.8.1 Proposed Action

Under the Proposed Action all federal Notice and Plan operations would be reviewed by a cultural resources specialist. A Class I Inventory would be done, which consists of a check of literature sources and the Alaska Heritage Resources Survey (AHRS) files maintained by the Alaska State Historic Preservation Officer's (SHPO) office. This constitutes an "appropriate level inventory" under 43 CFR 3809. At the end of the season, a compilation of all inventories on actions would be submitted to the SHPO's office as part of a Memorandum of Understanding between BLM-Alaska and the SHPO. A paragraph describing the operator's responsibility for cultural resources would be included in both Notice and Plan letters mailed to the operators. Information on known prehistoric, paleontological, or historic resources in the area and/or cultural resources potential would be included in the case file. Most cabins and/or old mining structures and equipment are privately owned, part of the surface estate, or are not significant cultural resources. These would be generally noted or documented during on-site compliance inspections, along with references to identified paleontological or prehistoric materials.

Direct impacts would be the actual destruction of sites, structures, or materials. Indirect impacts would result from the increased accessibility of the area to people and the potential for damage to sites, structures, and materials from ORV's, hikers, and collectors.

To date, no previously undiscovered cultural resources requiring preservation or mitigation have been found in this drainage; therefore, the potential conflict between 36 CFR 800 and 43 CFR 3809 would not be raised (Section 3.8.5).

4.8.2 Alternative A

Assessment and examination for cultural resources would be conducted as discussed under the Proposed Action. It is unlikely that any change in impacts to cultural resources would result. As procedures are the same for cultural resources under the different alternatives, the difference in impacts

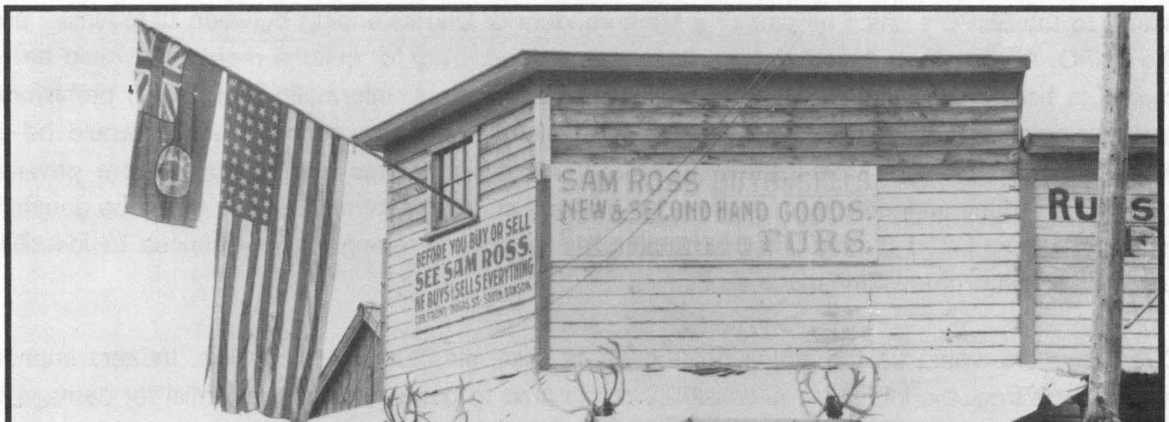
would be addressed in site-specific environmental analyses and in frequency of monitoring. This is compatible with the goals of the Beaver Creek National Wild River Management Plan and the White Mountains National Recreation Area RMP Record of Decision.

4.8.3 Alternative B

Assessment and examination for cultural resources would be conducted as discussed under the Proposed Action. It is unlikely that this alternative would cause any change in impacts to cultural resources. As procedures are the same for cultural resources under the alternatives, the differences in impacts would be addressed in site-specific environmental analyses. This is compatible with the goals of the Beaver Creek National Wild River Management Plan and the White Mountains National Recreation Area RMP Record of Decision.

4.8.4 Alternative C

Assessment and examination for cultural resources would be conducted the same as for the Proposed Action. It is unlikely this alternative would cause any change in impacts to cultural resources. As procedures are the same for cultural resources under all the alternatives, the difference in impacts would be addressed in site-specific environmental analyses and in frequency of monitoring.



Wares of the northern fur trade, circa 1908. From the "Toni" Troseth collection. Courtesy of the Alaska and Polar Regions Department Archives, University of Alaska, Fairbanks.

4.8.5 Alternative D

There would probably be little further impact to cultural resources as a result of the no mining alternative. Previously undisturbed prehistoric sites and paleontological resources would remain unexposed, undamaged, and undiscovered. Historic mining sites, which are generally not protected by federal legislation, would remain largely intact, although many old cabins, which are seasonally used and maintained by the miners, would be abandoned and subject to more rapid decay. Continuous natural erosion of drainages may damage and expose cultural and paleontological resources.

4.8.6 Special Considerations

Cumulative Impacts

Cumulative impacts of placer mining activity on cultural resources are difficult to evaluate. Inventories of cultural resources have located only a few sites in the Beaver Creek drainage. Historic mining activity has already disturbed most of the ground which has potential for cultural resources. Under all alternatives, further damage to both historic and paleontological resources will be minimized by continuing inventory of cultural resources and by following up on reports of discoveries by the miners.

Unavoidable Adverse Impacts

Since no testing and little survey would be done prior to most surface disturbing activity on mining operations, there is a possibility that cultural or paleontological resources would be impacted or destroyed without the operators' knowledge. Even if extensive testing and surveying took place, the potential for missing such resources is great due to heavy vegetation, the large areas involved, and the depth of burial for most sites. Heavy equipment can and does destroy such resources without the operator being aware of the damage. Historic mining resources, which are not generally protected by federal legislation, can and have been destroyed.

Short-Term Uses vs Long-Term Productivity

Cultural and paleontological resources would be preserved to a greater extent if no mining took place, but the knowledge gleaned from these discoveries would not exist. However, it does not seem likely that continued operation with heavy equipment would result in much further discovery due to the destructive nature of such techniques. Constant monitoring of such operations may result in better discovery and recovery, but it could also slow mining operations. The occasional new find resulting from such an effort does not seem worthwhile in view of the scarcity of resources found to date.

Irreversible and Irretrievable Commitments of Resources

Prehistoric and historic cultural resources and paleontological resources are finite and non-renewable for any particular time period. Regardless of standards set for differing alternatives, it would be the initial surface-disturbing activity that primarily impacts such resources. Such resources, once damaged, would be irretrievably lost. Not only would the material possibly be lost, but so would the scientific knowledge to be potentially gained from an undisturbed site. These resources may include structures, soil stratigraphy, bones and other fossils, pollen, and ash. The process of assessing and monitoring individual mining operations is the most important form of protection for these resources.

4.9 Subsistence

Subsistence uses and needs may be affected to varying degrees by a variety of causes. In general, any action which disturbs the land, its vegetative cover, the quality or quantity of water resources, wildlife or fish populations, or human or animal access routes may have an impact on subsistence uses and needs.

Such potentially impacting actions may occur all at once or gradually, so that the cumulative impact may build over time to increasingly affect subsistence. Further, cumulative impacts to subsistence uses and needs may occur strictly from human-caused events, or from naturally caused effects, or a combination of the two. When the latter is the case, it often becomes very difficult to quantify exactly how much of the cumulative impact is human- caused versus how much is caused by nature. Moreover, agreement on exact percentage of human versus nature-caused impacts may be difficult to achieve due to the differing viewpoints or assumptions of people viewing the impacts. Also of potential dispute is how much of impacts seen today are the result of recent or ongoing events versus how much were caused by past events which, in some cases, could still be causing effects.

In general, placer mining has the potential to impact subsistence uses and needs in the following ways:

1. Through a reduction in the potable water quality of a stream used as a source of drinking water.

2. Through disturbance or destruction of fisheries, animal populations, or habitats which support subsistence fishing, hunting, or trapping.

3. Through sedimentation of waterways which then impede human access to subsistence resources.

4. Through resulting increased harvest pressure due to the creation of more or better access routes into an area.

Other examples of human-caused potential impacts in the Beaver Creek drainage include changes in hunting/trapping/fishing technology, changes in the numbers of people involved, or changes in the amount of harvest.

In the latter examples, the federal government, including BLM, may or may not have full or even any control over the impact. Also, fires may be human-caused, but their effects may be just as unpredictable as natural fires for destroying or improving wildlife habitat, populations, or causing sedimentation of streams. Further, developments may occur on private or State lands, besides federal lands, and lead to new subsistence patterns or pressures. And the type or amount of subsistence resource harvest can vary due to decisions by the State of Alaska in regulating fish and game.

Other potential human-caused impacts to the Beaver Creek drainage relate to the amount of enforcement of environmental laws by responsible State or federal agencies besides the BLM (see further discussion in Chapter Two).

Finally, examples of potential nature-caused impacts to subsistence uses and needs in the Beaver Creek drainage include: natural stream changes, erosion, and sedimentation; and natural permafrost degradation, also resulting in sedimentation.

As noted in the subsistence section in Chapter Three, present village-based subsistence usage of Beaver Creek is downstream from mining activity on BLM lands in the headwaters, and is done predominately by residents of Birch Creek Village. Farther downstream, toward the confluence of Beaver Creek with the Yukon River, some additional subsistence usage is documented for residents of Fort Yukon and Beaver village. As shown on the subsistence use area maps, overall subsistence usage of the Beaver Creek drainage extends approximately 30 miles upstream from Birch Creek Village. This approximate maximum extent is downstream also about 30 miles from the closest mining claims on federal land. Thus, the past, current, or potential impacts to subsistence users and resources from mining are indirect, and would involve events upstream from where village-based subsistence users usually go for harvesting resources at the present time.

ANILCA 810(a) Evaluation and Finding -- General Consideration

One of the purposes of an ANILCA 810 evaluation is to identify whether subsistence uses are being significantly restricted. Under the BLM definition of a "significant restriction to subsistence use" (see glossary), this level of restriction appears not to have happened in the past, nor to be happening now from mining activities or other causes (see Chapter Three). However, certain long-term gradual decreases or changes in fish and wildlife populations may have occurred in the past or are occurring now. If not mitigated, these could cause more pronounced future impacts to those resources and associated subsistence usage, such that a significant restriction might occur (Section 4.7, Fisheries). To follow, the focus of each respective ANILCA 810 evaluation and finding for each alternative will be on how much, if any, new or increased contributions it would make in causing the downstream effects of:

1. Decreased fish or wildlife populations, including reduction indirectly caused through increased access.

2. Decreased terrestrial or aquatic habitat.

3. Decreased access to subsistence resources.

4. Any other water-related impacts, such as turbidity or deterioration of potential drinking water.

ANILCA Section 810 (a): Consideration of the Availability of Other Lands and Other Alternatives.

At the end of this environmental analysis process, BLM will have analyzed all and only the lands relevant to the purposes of this study, namely the lands involved in the Beaver Creek watershed. Thus, this document is considering all relevant lands so that there are no "other lands" which could be considered. The Proposed Action and the four alternatives constitute the "other alternatives" required for consideration by ANILCA Section 810.

4.9.1 Proposed Action

Past and Projected Future Cumulative Impacts

Mining has caused no significant cumulative past impacts to subsistence uses or needs. This is because only one mine operated in 1987, and it was designed for zero discharge of water so that no sediment from it would directly enter Beaver Creek. Its overall success meant that there were no nearby or downstream significant negative effects from this single mine. And as a result, downstream fish and wildlife populations, habitat, drinking water, and human access routes received no impacts.

While only one mine operated in 1987, as noted, three questions could be asked regarding potential subsistence impacts under the Proposed Action:

1) What if all five mining operations proposed in 1987 had operated?

2) What if even more than five mining operations had occurred?

3) What if future mining were to occur in new areas on federal claims in the Beaver Creek drainage?

The answer to all three is virtually the same; namely, it is projected that notable impacts related to subsistence uses and needs could be avoided so that the level of potential future restriction to subsistence, if any, would not be significant. The reason is that while additional surface disturbances undoubtedly would occur in the upper reaches of Beaver Creek, where the only mining claims are located, those impacts would be duly regulated and mitigated on-site, with the prime objective being to avoid downstream impacts.

In the future, regardless of the number of mining operations, water quality standards would be applied to all of them, meaning that the water quality of Beaver Creek would not be allowed to deteriorate below set standards of acceptability. Again, as in 1987, the result would be no notable downstream impacts on fish and wildlife populations, habitat, drinking water, or human access.

Potential future cumulative sedimentation, particularly from non-point sources, like erosion of mining areas during high runoff, may affect fish spawning areas nearest the active mining (Section 4.7, Fisheries). Yet, in the future, if such sedimentation were to occur, it would have the effect of decreasing upstream spawning areas so that spawning might be pushed farther downstream. If this were to happen, subsistence fishing, which occurs downstream anyway, should not be notably affected as fish would still be present.

Finally, as to the cumulative effects of increased access being created due to increased mining, additional recreationists and others likely would enter the upper Beaver Creek drainage. This would mean, at worst, potential resulting decreases in local animal and fish populations by increased harvest pressures, or by certain species avoiding the presence of humans. Yet, however true these theoretical effects would be in reality in upper Beaver Creek, this area is relatively remote from general village-based subsistence use areas. Consequently, such potential impacts are judged unlikely to be felt in those villages to any significant extent. Related to this, it is necessary to remember that the moose population of upper Beaver Creek is not the same as the one harvested in the downstream subsistence use areas. Further, if new fishing pressures were to develop in upper Beaver Creek, the State of Alaska has regulatory authority and responsibility to adjust harvest levels so that stocks are not significantly reduced and that subsistence usage be given a priority over sports usage. The same is true for major animal species, like moose.

Compliance with Section 810 (a) of ANILCA; Evaluation and Finding

1. **Uses and Needs.** As discussed above and elsewhere, the Proposed Action is to have mining result in no notable impacts to water quality of Beaver Creek. As a consequence, mining would have no significant impacts on subsistence uses or needs as downstream fish and animal populations, habitat, and human access to subsistence resources would not be impacted in any way. The cumulative effect would be that any new mining under the Proposed Action would not add in any notable degree to any prior accumulation of impacts that might have resulted from past mining or any other human-caused events.

2. **Section 810 (a) Finding for the Proposed Action.** The Proposed Action would not result in a significant restriction to subsistence uses. The direct reasons for this finding are given in the preceding sections with supporting information found in other sections analyzing the impacts to fish, wildlife, water, and soils for this alternative.

4.9.2 Alternative A

Alternative A would be similar to the Proposed Action. The main difference is that performance standards under Alternative A for reclamation of fish and wildlife habitats, and soil and vegetation stabilization would be less restrictive than under the Proposed Action. Yet, the overall likely downstream effects on subsistence resources and users essentially would be unchanged because water quality standards would remain the same as under the Proposed Action. Thus, the net effect of impacts to subsistence uses, users, and resources would be the same as under the Proposed Action, namely none at all. Accordingly, the impact analysis statements concerning subsistence for the Proposed Action apply to Alternative A, and should be read for further information.

Compliance with Section 810 (a) of ANILCA: Evaluation and Finding

1. **Uses and Needs.** The statements made under this heading for the Proposed Action completely apply to Alternative A because the finding of no net effect on subsistence uses and needs is the same.

2. **Section 810 (a) Finding for Alternative A.** Alternative A would not result in a significant restriction to subsistence uses. The direct reasons for this finding are given in the preceding sections, with supporting information found in other sections analyzing the impacts to fish and wildlife, water, and soils for this alternative.

4.9.3 Alternative B

Alternative B would be similar to the Proposed Action and Alternative A. Performance standards for water quality would remain the same, leading to the same lack of potential downstream impacts to subsistence uses, users, and resources. Reclamation standards, however, are somewhat more stringent than Alternative A. As a result, the likely downstream effects of Alternative B, like the Proposed Action, would be none at all. Accordingly, the impact analysis statements concerning subsistence for the Proposed Action apply to Alternative B and should be read for further information.

Compliance with Section 810 (a) of ANILCA: Evaluation and Finding

1. **Uses and Needs.** The statements under this heading for the Proposed Action completely apply to Alternative B because the finding of no net effect on subsistence uses and needs is the same.

2. **Section 810 (a) Finding for Alternative B.** Alternative B would not result in a significant restriction to subsistence uses. The direct reasons for this finding are given in preceding sections, with supporting information found in other sections analyzing the impacts to fish and wildlife, water, and soils for this alternative.

4.9.4 Alternative C

Alternative C would be similar to the Proposed Action. The main difference, as related to subsistence, is that water quality performance standards are more stringent. The likely downstream effects on subsistence uses, users, and resources again would not be different than under the Proposed Action or Alternatives A or B, namely none at all. Thus, once more the impact analysis statements concerning subsistence for the Proposed Action apply to Alternative C and should be read for further information.

Compliance with Section 810 (a) of ANILCA: Evaluation and Finding

1. **Uses and Needs.** The statements made under this heading for the Proposed Action completely apply to Alternative C because the finding of no net effect on subsistence uses and needs is the same.

2. **Section 810 (a) Finding for Alternative C.** Alternative C would not result in a significant restriction to subsistence uses. The direct reasons for this finding are given in the preceding sections with supporting information found in other sections analyzing the impacts to fish and wildlife, water, and soils for this alternative.

4.9.5 Alternative D

As indicated under the description of this alternative, no mining would occur on federal mining claims although stabilization of surface disturbances that have occurred since 1980 would be required. Further restoration of mined areas would proceed by natural processes. The net result of this for subsistence uses, users, and resources would be in the range of minimal to no impact.

As for the possibility of any impacts occurring, conceivably, natural erosion during spring runoff or at other times of high water could cause some turbidity in Beaver Creek from areas where further restoration would not take place. Still, as discussed in the water and aquatic fauna impacts assessment sections for this alternative, the resulting downstream effects, even if this were to happen, are predicted to be negligible and temporary. They would not contribute appreciably to the accumulation of past events that may have caused some degree of impact to subsistence resources or activities in or around Beaver Creek. Otherwise, the likely downstream effects on subsistence resources and users would be no different than under the Proposed Action or any alternative. In terms of access, potential impacts might even be less. This is because without further mining in the future, fewer access roads would be built and presumably fewer people would enter the area to potentially impact fish and wildlife or their habitats. Overall, the level of impacts would be similar to those otherwise stated for the Proposed Action. Thus, information stated there applies to Alternative D and should be read.

Compliance with Section 810 (a) of ANILCA: Evaluation and Finding

1. Uses and Needs. The statements made under this heading for the Proposed Action essentially apply to Alternative D because the net effect is similar on subsistence uses and needs. As noted in the preceding section, the impact to subsistence uses, users, and resources would be in the range of minimal to none, with the overall effect still negligible even under a "minimal impact" situation, where natural erosion might cause turbidity in Beaver Creek on a temporary basis.

2. Section 810 (a) Finding for Alternative D. Alternative D would not result in a significant restriction to subsistence uses. The direct reasons for this finding are given in the preceding sections, with supporting information found in other sections analyzing the impacts to fish and wildlife, water, and soils for this alternative.

Summary of ANILCA Section 810 (a) Findings

The findings for all alternatives, including the Proposed Action, were the same; namely, none would result in a significant restriction to subsistence uses. This is because the predicted impacts to subsistence uses, users, and resources under all alternatives were evaluated to be negligible or nonexistent. This conclusion was reached for each alternative because only negligible-to-no effects were predicted from any of the alternatives on animal populations, habitat, human access, or general water quality, particularly in the downstream region of Beaver Creek where direct subsistence usage does occur by Birch Creek Village residents and others.

Finally, it should be noted that in arriving at these evaluations and findings, potential immediate, future, and cumulative impacts were considered, with the reader referred to the respective impact analysis sections for details on each alternative.

4.9.6 Special Considerations

Cumulative Impacts

Cumulative impacts to subsistence resources are a complex interrelationship of impacts to the natural resources of habitat, wildlife and fisheries populations, and impacts by humans including harvest by subsistence and non-subsistence users, and changes in cultural patterns, over time. No cumulative impacts to subsistence resources and uses have occurred during the period of historic mining, and no significant restriction is projected for the Proposed Action or any of the alternatives.

Unavoidable Adverse Impacts

Under the Proposed Action and all alternatives, no cumulative unavoidable impacts are likely to occur to downstream areas utilized for subsistence purposes by residents of Birch Creek village or other villages. See preceding sections supporting this conclusion.

Short-Term Uses vs Long-Term Productivity

The Proposed Action and all alternatives should have no notable impacts to cause either long-term or short-term productivity changes in the availability of wild, renewable resources used for subsistence purposes by downstream residents of the region. Again, see preceding sections supporting this conclusion.

Irreversible and Irretrievable Impacts

Also, under the Proposed Action and all alternatives, no irreversible and irretrievable impacts are likely to occur to downstream areas important to village-based subsistence users, for reasons again given in preceding sections.

4.10 Recreation and Visual Resources

4.10.1 Proposed Action

Recreation

The Proposed Action would affect visitor distribution, and would consequently influence the percentage of total visitor use attributable to certain activities at specific locations within the White Mountains NRA. Specifically, the creation of 26.2 miles of additional roads (364% above present mileage) over the next 10 years in the drainages listed in Section 3.2.2 would provide additional opportunities for motorized recreation in those locations. Conclusions presented below about the effects on specific opportunities are based on the following assumptions:

1) All mining access routes would be available for use by the general public.

2) In summer, mining roads would be open to highway- licensed vehicles, and would normally be negotiable by two-wheel drive pick-up truck. In winter, the roads would be open to snow machine use.

3) All mining trails would be open to snow machine use, and, if they are summer trails, to ORVs of less than 1,500 pounds GVW. Summer mining trails are presumed closed to recreational use by vehicles in excess of this weight limit. In practice, public use of mining access routes, and limitations on types of vehicles, would be evaluated on a case-by-case basis for individual routes as the routes are constructed. For particular routes, actual decisions may vary as necessary from the assumptions made here, to protect resources, and reduce conflicts between users. These decisions would also be based on changes in visitor demand for particular types of activities.

Based on the stated assumptions, opportunities for the summer/fall activities of dispersed site camping, recreational gold panning, general touring and sightseeing, and the wintertime activities of snow machining and dog mushing would all be enhanced by the Proposed Action. There would

also be additional opportunities for vehicle-based big game hunting, although there would not necessarily be a long-term change in hunter success rates. The beneficial effect of increased hunting access would be counterbalanced to an unknown degree by adverse effects that could reduce big game populations, particularly moose, as described in Section 4.6.1. Available data are inadequate to accurately quantify the net effect of the Proposed Action on hunter success, although over the long term, large-scale changes are not expected.

Because 23.3 of the new road miles would represent an upgrade of existing trails, current summer/fall trail riding opportunities for ORVs of less than 1,500 GVW would be displaced from present locations. But because 21 miles of new trails would also be created under the Proposed Action, the actual reduction in ORV trail-riding opportunities would be small (10% less trail mileage than at present). Present trail-riding use would essentially be redistributed to other locations.


Fishing

New vehicle roads and trails would decrease the quality of summer non-motorized opportunities such as hiking and horseback riding in the particular drainages where they are located. However, these drainages are in the southeast portion of the NRA, in the Foothills management unit, where the recreation management emphasis defined by the RMP and RAMP is on enhancing motorized recreation opportunities, as summarized in Section 3.10 of this document. None of the new roads and trails would penetrate the Highlands or National Wild River management units where non- motorized summer uses are emphasized. Therefore, the principal effect of the Proposed Action upon recreation opportunities within these units would be the possible enhancement of access to their boundaries, an action which also complements the stated goals and objectives of the RAMP and the RMP. Making these units more accessible would indirectly increase the number of primitive recreation opportunities available in these units, particularly for day users.

The Proposed Action would have minimal effects on the quality of float boating opportunities on the Beaver Creek NWR, and most other non-motorized recreation opportunities in the NWR and Highlands management units. The Proposed Action's water quality standards impose limits on sediment load and turbidity that are visually undetectable, and so would not influence visitor perception of water quality. Although periodic accidental seeps and discharges may temporarily cloud the water, this represents no change from past and present conditions, when mining activity has periodically clouded the waters of Nome Creek, occasionally extending as far downstream as mile 30 of Beaver Creek NWR. Duration and frequency of such episodes is not expected to increase appreciably, assuming active enforcement of water quality standards. Although float boaters and other users have reported dissatisfaction with these temporary conditions, the presence of cloudy water has had no noticed effect on the amount of recreation use on the Beaver Creek NWR. Therefore, from a visual

standpoint, mining's effect on water quality is considered to have a minor adverse impact on the quality of recreational float boating opportunities on the NWR. Water turbidity has the greatest effect on boaters as they negotiate Nome Creek enroute to the NWR, because it compounds the difficulty of floating this shallow tributary. This impact will be partially mitigated by the planned construction of the Nome Creek Road as outlined in the RAMP (DOI 1988a), because the necessity for drive-in users to float Nome Creek to reach the NWR will then be eliminated.

Although visually insignificant, changes in natural water quality as a result of the Proposed Action may have a measurable cumulative short-term impact on game fish populations, as described in Section 4.7 (i.e., fish may not inhabit a stream segment while mining is occurring). If game fish populations decline to a degree where the quality of the fishing experience is reduced as measured by angler success, then there would be adverse effects on recreation. However, fishing tends not to be a primary activity that draws visitors to the White Mountains NRA, but instead is usually a secondary use associated with other uses, primarily float boating, hunting, or camping. With recreationists for whom fishing is a secondary purpose for visiting the White Mountains NRA, a short-term reduction in the quality of fishing opportunities would, to a small extent, reduce the quality of the overall recreation experience. But in general, the value of fishing in the context of the overall recreation experience, coupled with the reduction in the quality of opportunities, would not be significant enough to cause a reduction in visitor use. On the other hand, with recreationists for whom fishing is the primary purpose of their visit, the quality of the experience could be reduced sufficiently to cause approximately a 25% decline in use levels. However, in 1987, recreation use for the primary purpose of fishing accounted for only 300 (one-half of one percent of the total) visitor use days, as presented in Figure 3-4. Because fishing accounts for so little visitation, the adverse impact as a result of a short-term decrease in the quality of fishing opportunities would be considered minor. Over the long term, it is possible that the quality of recreational fishing opportunities as measured by angler success would improve compared to present conditions, since some old dredge tailings would be mined and rehabilitated to provide better quality fish habitat than exists now, potentially resulting in a long-term increase in game fish populations.

Additional adverse impacts to recreation would be centered on the degree to which mine sites and associated access routes are perceived as an unwanted visual intrusion which detracts from the recreation experience. It should be noted that the presence of mines is perceived as a recreational attraction to some users, primarily motorized sightseers and others interested in historical and ongoing mining operations. However, for the majority of users interested in pursuing a primitive type of recreation experience, areas with concentrations of mining activity and other obvious human alteration to the natural environment are assumed to detract from the perceived quality of the recreation experience.

To evaluate the extent of the impact of mining activity on the quality of primitive recreation opportunities, the area disturbed by mining activity must be placed in perspective as an incremental change to the existing environment. The Proposed Action would disturb an additional 115 acres, for an initial increase of 33% above the previously disturbed area of 355 acres, as presented in Figure 2-3. Since 51 acres would eventually revegetate and return to a natural appearance, the long-term effect would be that 64 acres, or about 21% more acreage than would result from present disturbance, would remain visibly disturbed by mining activity. Because this acreage is primarily ad-

jacent to previously mined areas, because it represents a very small portion of the approximate 1,000,000-acre White Mountains NRA, and because it is visible from few locations within the areas designated to provide for primitive recreation (Highlands and Wild River Corridor management units) the adverse impact on the quality of primitive recreation opportunities would be minor. During that part of the year when the mines are active (approximately June to October), the sound of motorized equipment would be a secondary factor contributing to the impact, at distances dependent on the screening effect of surrounding topography and vegetation, but up to about one mile from the mine area. However, the visual effect constitutes the largest and most lasting component of this minor adverse impact. The visual impact of mining activity is discussed further under Visual Resources, which follows.

In conclusion, the Proposed Action would not significantly affect the overall level of recreation use, or its upward trend. Although projected route construction in the Foothills management unit would provide more opportunities for motorized recreation, and also indirectly provide additional opportunities for primitive, non-motorized recreation by improving access, this effect cannot be attributed solely to the Proposed Action. According to the RMP and RAMP for the White Mountains NRA, development of some trails, trailheads, and additional road access would occur anyway to provide additional recreation opportunities and thereby increase visitation. With little or no modification to the initial proposal, mining route construction would possibly provide portions of the following recreation access routes identified in the RAMP, Section V, Table 1: continuation of Bear Creek Trail and Nome Creek Road. New mining access routes may be capable of serving additional identified recreation needs; the potential would be evaluated when specific proposals are received. To the extent that mining developments help achieve RAMP goals, BLM construction plans can be altered. Construction of mine access routes in the Foothills management unit would complement the existing management plans, assuming such routes also provide useful recreation access, and that the unit's semi-primitive character is maintained. Minor negative impacts center around the visual effect of mining operations on the quality of primitive recreation opportunities, and the potential short-term reduction in the quality and quantity of fishing opportunities due to changes in natural water quality. Over the long-term, fishing opportunities would be unchanged from current conditions, or possibly enhanced slightly.

Visual Resources

Visual quality is mentioned in the preceding discussion of recreation, strictly from the standpoint of how changes in the landscape are perceived by recreationists. Here visual resources are considered in absolute terms, according to how changes in the landscape can be technically measured using the rating criteria of BLM's VRM system.

Past mining activity has generally altered the characteristic landscape on 352 acres, principally in VRM Class III, but also in VRM Class II. Under the Proposed Action mining would continue on active claims in VRM Class III, with new disturbance of 115 acres (64 acres over the long term). In addition, 24 miles of mine access routes would be constructed.

As part of the Proposed Action, all proposed surface-disturbing activities would undergo a visual resource assessment to determine the proposal's individual and cumulative impacts relative to the VRM Class in which it is located. The results of the assessment would be used to modify project design, or select other mitigating measures to minimize the degree of visual impact.

The most severe past impacts to visual resources have been on Nome Creek, but if subsequent operations are carefully managed to successfully employ all mitigating measures identified during the visual resource assessment for the particular project, short-term visual quality would be not be measurably reduced. In fact, new mining occurring in previously mined but unreclaimed areas would have a beneficial impact over the long term, because rows of old tailings would be reshaped to a more natural appearance.

Visual quality objectives would continue to be met within other areas designated as VRM Class III. Although mining activity and associated route construction would alter the characteristic landscape, the level of change would be within the VRM class limitations. Where mining occurs on undisturbed sites adjacent to previously mined areas, the cumulative effect would be that the growing area of mining disturbance would become visually more apparent as a change in the characteristic landscape. However, mitigation measures could be employed to assure that areas of growing surface disturbance do not "dominate the view of the casual observer," and thus remain within VRM Class III objectives. In any case, even though collectively these mine sites would attract more attention than any of them would individually, the scenario of having many widely scattered mining sites would constitute a greater overall negative impact to visual resources.

In conclusion, the Proposed Action would have localized short- term negative impacts to visual resources on 115 acres previously undisturbed by mining. Reclamation would reduce this area to 64 acres over the long term. Impacts on these newly mined areas would remain within the visual quality objectives for their VRM class. In cases where the limits of the visual quality objectives have already been reached by past activity, the visual quality would not deteriorate further and may even improve slightly as a result of being re-worked, as described above. Some reclaimed areas would be fertilized and reseeded, reducing the time period needed for restoration of a natural appearance in areas capable of supporting vegetation. Therefore, the Proposed Action's overall effect on visual resources is considered a minor negative impact.

4.10.2 Alternative A

Recreation

The same assumptions set forth for the Proposed Action regarding recreational use of mining access routes are also applied to evaluate the consequences of Alternative A. Alternative A would have the same types of effects as the Proposed Action, but would cause incremental differences in the degree of impact. Only these differences are described below; other effects of Alternative A are considered identical to those of the Proposed Action.

Alternative A would create 21.9 miles of additional roads over the next 10 years, or 304% more mileage than what currently exists. It would thus create additional opportunities for the summer/fall vehicle-based activities of dispersed site camping, recreational gold panning, general touring and sightseeing, hunting, and the winter activities of snow machining and dog mushing. The additional roads under Alternative A would total 4.9 fewer miles than under the Proposed Action and would thus create slightly fewer new opportunities. However, considering the increase over current mileage, the two alternatives are very similar.

As with the Proposed Action, current summer/fall trail-riding opportunities for ORVs of less than 1,500 pounds GVW would be redistributed to other locations. Compared to current conditions, the 20% reduction in trail mileage under Alternative A (double the impact of the Proposed Action) would cause a moderate reduction in these types of opportunities.

Compared to the Proposed Action, the effects of Alternative A on water quality would not have measurably different impacts to the quality of float boating opportunities on Beaver Creek NWR, or to recreational fishing use and the quality of those opportunities over the short-term. However, since fish habitat restoration would not be as intensive, there would be no long-term enhancement of fishing opportunities.

As with the Proposed Action, the visual effect of areas disturbed by mining under Alternative A would have a minor adverse impact on the quality of primitive recreation opportunities. The incremental differences of Alternative A are small: The disturbance of 100 acres would represent a short-term increase of 28% above previously disturbed acreage. Since 20 acres would eventually revegetate and return to a predominantly natural appearance, the long-term effect would be that 80 acres, or about 27% more acreage than would result from present disturbance, would remain obviously disturbed by mining activity. Because in contrast to the Proposed Action, Alternative A would not require the reshaping of tailings to approximate natural conditions, its adverse impact would be slightly more severe. However, the difference is considered negligible. Obvious signs of civilization detract from the quality of a primitive recreation experience. Areas stripped of vegetation fit this description by themselves. Whether they are recontoured or not, barren areas stand out as a visual intrusion and therefore have approximately the same effect on a recreationist.

In conclusion, the effects of Alternative A would be very similar to those of the Proposed Action, with incremental differences that would be largely undetectable by recreation visitors. The most significant difference between Alternative A and the Proposed Action is its greater reduction in summer trail-riding opportunities for small ORVs. Also, Alternative A has no potential to enhance fishing opportunities over the long term.

Visual Resources

Under Alternative A, because reclamation would not include reshaping of tailings to approximate natural topography, there would be no long-term visual improvement when old mined areas are reworked. In newly mined areas, the lack of reshaping would create contrast not only in texture and color, but also in form and line, when compared to the natural landscape. This added contrast would make it more difficult to meet the visual quality objectives of VRM Class III. Because topsoil

would not be respread and there would be no fertilizing or seeding during reclamation, revegetation would be slower and disturbed areas would remain readily visible as such for a longer time than under the Proposed Action.

4.10.3 Alternative B

Recreation

All of the previously stated assumptions apply to Alternative B. In absolute terms there are small differences between Alternative B and Alternative A. Over the long term, Alternative B would cause less acreage to remain barren, and would have a slightly smaller adverse impact to fish habitat.

However, in practical terms these differences would not translate into noticeably smaller adverse impacts to the quality of primitive recreation opportunities, or the amount of recreational fishing use and the quality of those opportunities. Therefore, from a recreation standpoint, Alternative B is considered identical to Alternative A.

Visual Resources

From a visual resources standpoint, the negative impacts of Alternative B would be less than those of Alternative A. Although Alternative B would disturb the same acreage as Alternative A, reclaimed areas would be reshaped to blend with the natural surroundings, reducing the visual contrast of the mine site and resulting in a long-term positive impact where old, unreclaimed mine areas are reworked. Compared to Alternative A, fewer acres would remain barren over the long-term, and areas capable of supporting vegetation would regrow within 30 to 50 years, shortening the time that reclaimed mine sites present a marked visual contrast to the natural landscape.

4.10.4 Alternative C

Recreation

All of the previously stated assumptions apply to Alternative C. This alternative would have many of the same effects as the Proposed Action, and except as described below, is considered identical.

Alternative C would create 17.2 miles of additional roads over the next 10 years, or 239% more mileage than what currently exists. It would thus create additional opportunities for the summer/fall vehicle-based activities of dispersed site camping, recreational gold panning, general touring and sightseeing, hunting, and the winter activities of snow machining and dog mushing. The additional roads under Alternative C would total nine fewer miles than under the Proposed Action and would thus create fewer new opportunities.

As with the Proposed Action, current summer/fall trail-riding opportunities for ORVs of less than 1,500 pounds GVW would be redistributed to other locations, since most existing trails would be upgraded to roads. Compared to current conditions, the 35% overall reduction in trail mileage under Alternative C (three and one-half times the impact of the Proposed Action) would cause a moderately large reduction in these types of opportunities.

Alternative C has the strictest water quality standards of any of the other mining alternatives. However, because these standards are visually indistinguishable from the other alternatives, Alternative C would have the same impacts (i.e., not discernible from present or past conditions) on the quality of float boating opportunities on Beaver Creek NWR.

In the short term, Alternative C would have less adverse impact to recreational fishing than the other mining alternatives, because impacts to fish habitat would be less, as described in Section 4.7. Over the long term, it is possible that the quality of recreational fishing opportunities as measured by angler success would improve compared to present conditions, since some old dredge tailings would be mined and rehabilitated to provide better quality fish habitat than exists now.

Compared to the other mining alternatives, Alternative C would have slightly less adverse impacts to primitive recreation experiences from the visual effect of mining disturbance. Based on calculations made from the data in Figure 2-3. Alternative C would disturb 84 acres, for a short-term increase of 24% above previous disturbance of 355 acres. Since 37 acres would revegetate and return to a natural appearance in 30 years, the long-term effect would be that 47 acres, or about 16% more acreage than would result from present disturbance, would remain visibly disturbed by mining activity. As with the other alternatives, the impacts resulting from Alternative C must be evaluated in the context of their overall effect on primitive recreation experiences in the White Mountains NRA and Beaver Creek NWR. The adverse impact of Alternative C, though less than that of the Proposed Action, is considered minor.

In conclusion, Alternative C would have a smaller positive impact on vehicle-based recreation than the Proposed Action, but it would also have a greater negative impact to summer trail-riding opportunities for small ORVs. Alternative C would have a minor adverse impact on the quality of the primitive recreation experience, but proportionately less than any of the other mining alternatives. Over the long-term, fishing opportunities would be unchanged under Alternative C, or possibly enhanced slightly.

Visual Resources

Alternative C would have the slightest negative impact of all the preceding mining alternatives. This conclusion is based on the projections of fewer mines operating, less acreage disturbed over the short term and remaining barren over the long term, and intensive reclamation efforts as in the Proposed Action, including re-establishing original grade and configuration of streams. These factors would reduce the overall level of visual contrast mining operations cause to the natural landscape. The requirement that reclaimed areas be fertilized and reseeded would reduce the amount of time needed for restoration of a natural appearance in areas capable of supporting vegetation.

4.10.5 Alternative D

Recreation

Although mining would cease, 300 acres, or most of the presently disturbed area, would remain barren or sparsely vegetated. The negative visual impact of mine sites on the quality of primitive recreation opportunities would therefore continue at near present levels. The absence of sounds generated by mining equipment, after reclamation is completed on sites disturbed since 1980, would have a positive impact on primitive recreation opportunities.

Frequency of noticeably turbid stream flows would decrease from their present level, and would probably be limited to periods of high water when streams are naturally muddy-looking, thereby marginally improving the quality of float boating opportunities on the upper reaches of Beaver Creek NWR.

Although recreational fishing opportunities may not improve without rehabilitation of previously disturbed fish habitat, neither would these opportunities suffer further declines.

In conclusion, Alternative D would have an overall slightly positive impact to recreation, but without any dramatic changes from current conditions.

Visual Resources

No further negative impacts would occur. Impacts created by past mining activity would persist at near-present levels, since 300 acres would remain barren or sparsely vegetated.

4.10.6 Special Considerations

Cumulative Impacts

Cumulative negative impacts to the quality of primitive recreation opportunities and visual resources result from surface disturbance, water quality reductions and access route construction which has occurred from past, current, and projected mining in the watershed. Access route construction has also had cumulative positive impacts on both primitive and motorized forms of recreation. Mining has provided access into the watershed, with 23 miles of trails and seven miles of roads from historic and current activities. In decreasing order of additional access, the alternatives are: Proposed Action, Alternatives A and B, Alternative C, and Alternative D, which would perpetuate the current situation. For impacts to visual resources, see cumulative impacts to landcover (Section 4.5) for acreage of surface disturbance and long-term barren areas.

Unavoidable Adverse Impacts

Under all of the alternatives in which mining occurs, its effect on the quality of primitive recreation experiences is an adverse impact which cannot be totally mitigated. Similarly, any amount of mining activity would have some negative impact to visual resources.

Short-Term Uses vs Long-Term Productivity

Existing and projected new surface disturbance would have long- term effects on visual resources and the quality of primitive recreation, since a portion of the disturbed acreage would remain barren or sparsely vegetated after more than 50 years.

There may be a slight reduction in the quality of hunting opportunities (as measured by hunter success) in the upper watershed under all the mining alternatives, but overall this effect is expected to be slight. Alternatives A and B would cause a reduction in angler success, and hence the quality of fishing opportunities, if there are long-term adverse impacts that reduce game fish populations.

Irreversible and Irretrievable Commitments of Resources

Acreage that remains incapable of supporting vegetation as described in Section 4.5.6 constitutes an irreversible commitment of resources, and will thus have irreversible effects on visual resources and the quality of primitive recreation.

4.11 Economics

The description of economic impacts does not include indirect impacts to employment, income, and population because data are not available.

4.11.1 Proposed Action

The annual water treatment cost for a placer mine processing 50,000 cubic yards per year under the Proposed Action's performance standards is estimated to be $1,900 (EPA 1987). The water treatment technique selected to estimate cost is one hour of settling in a primary settling pond and three hours in the secondary pond. During the mining season the primary and secondary pond would be built four times and once, respectively. Most operators would probably need to obtain an EPA variance to meet the water quality standards of the Proposed Action. See Figure 2-6 for the estimated water treatment, reclamation, and BLM administration costs. See Appendix B-3 on BLM's administrative cost for each alternative.

The reclamation cost for a placer mine operating on federal claims is estimated to be approximately $3,400 per year. This estimate is based on each mine reclaiming two acres per year at a cost of $1,700 per acre. See Appendix B-1 for assumptions regarding mine disturbance and reclamation acreages. See Appendix E-3 for a breakdown of reclamation costs.

With a continuation of present management, it is assumed that the total number of mines within the watershed would increase from one to five over the next decade. If so, it is reasonable to also assume that mining expenditure, total output, mining employment, employment effect, mining income, and total income would increase by about the same magnitude.

Estimated economic impacts are displayed in Figure 4-7. These were extrapolated from data pertaining to Minto Flats placer mining compiled by Hagler, Bailly & Co. (1987). Based on anticipated employment levels, the activity in Beaver Creek was assumed to be about 0.3% of the Minto Flats activity.

4.11.2 Alternative A

Additional water treatment techniques would probably be necessary to meet the stricter water quality performance standards of this alternative (no EPA variance) and would undoubtedly increase the cost of compliance. The water treatment technique selected to meet these standards is the same simple settling system described in the Proposed Action, plus 100% recycle of mine process water. The annual water treatment cost for a placer mine, with the same capacity described in the Proposed Action, operating under the water quality performance standards of Alternative A is estimated to be $18,100 (EPA 1987). The choice of a specific method for treating mine effluent was made solely to estimate compliance cost. This choice is not intended to require, promote, or limit the use of a specific water treatment technique.

The reclamation cost for federal placer mines operating under Alternative A is estimated to be approximately $1,000 per year, or $500 per acre.

With Alternative A, it is assumed that the total number of mines within the watershed would increase from one to four over the next decade. It is also assumed that mining expenditures, total output, mining employment, employment effect, mining income, and total income would increase by about the same magnitude (Figure 4-7).

4.11.3 Alternative B

The estimated annual water treatment cost for Alternative B is the same as Alternative A, $18,100 per operation.

The reclamation cost for a placer mine operating on federal claims is estimated to be about $2,000 per year, or about $1,000 per acre. The cost breakdown is shown in Appendix E-3.

The effects of this alternative would be the same as Alternative A.

4.11.4 Alternative C

The compliance cost for water treatment under Alternative C would probably increase significantly over the costs for the other alternatives due to the very stringent water quality performance standards. A water treatment technique of simple settling, 100% recycle, and chemical flocculation was selected (solely for cost estimation purposes) to meet these rigorous standards. The estimated water treatment cost for a mine processing 50,000 cubic yards per year is estimated to be approximately $30,100.

	Proposed action	Alternatives A&B	Alternative C	Alternative D
Total Number of Mines	5	4	3	0
Percentage change from 1985				
MINING EXPENDITURES [1]				
Local	23,000	18,000	14,000	0
Fairbanks	123,000	99,000	74,000	0
Alaska	178,000	142,000	107,000	0
TOTAL OUTPUT [2]				
Fairbanks	203,000	162,000	122,000	0
Alaska	342,000	274,000	205,000	0
MINING EMPLOYMENT (FTE)				
Local [3]	3	2	2	0
EMPLOYMENT EFFECT [4]				
Fairbanks	3	2	2	0
Alaska	5	4	4	0
MINING INCOME [1]				
Rural Alaska	15,000	12,000	9,000	0
Fairbanks	19,000	15,000	11,000	0
Alaska	36,000	29,000	22,000	0
TOTAL INCOME [5]				
Rural Alaska	39,000	31,000	24,000	0
Fairbanks	41,000	32,000	24,000	0
Alaska	93,000	74,000	56,000	0

1 Beaver Creek Mining Expenditures extrapolated from Minto Flats Mining expenditures reported by Hagler, Bailey & Co., 1987. Table 10.
2 Taken from Hagler, Bailey & Co., 1987. Table 11 x .003 (% attributable to Beaver Creek Mining).
3 Hagler, Bailey & Co., 1987. pg. 3.18 x .003 (% attributable to Beaver Creek Mining).
4 Direct plus indirect employment generated by mining in the Beaver Creek drainage – taken from Hagler, Bailey & Co., 1987. Table 11 x .003 (% attributable to Beaver Creek Mining).
5 Total Income = Expenditures x appropriate income multiplied (Alaska Dept. of Commerce and Economic Development – Office of Mineral Development 1986 "The Role of Placer Mining in the Alaska Economy 1985.") x .003 (% attributable to Beaver Creek Mining.

Figure 4-7. Beaver Creek Economic Impacts.

The reclamation cost for federal placer mines is estimated to be about $3,400 per year, for two acres. The reclamation standard for this alternative is the same as discussed in the Proposed Action.

With Alternative C, it is assumed that the total number of mines within the watershed would increase from one to three over the next decade. It is also assumed that mining expenditures, total output, mining employment, employment effect, mining income, and total income would also increase by about the same magnitude.

4.11.5 Alternative D

Federal mines would not be operating under this alternative, but reclamation would be required on all federal claims that were disturbed after 1980. The estimated reclamation cost on these claims would be $500 per acre, the same as for federal mines operating under Alternative A.

Under Alternative D, validity exams would be conducted on all properly filed federal mining claims (roughly 131 claims in the Beaver Creek drainage) and appraisals would be completed on all valid claims (all claims were assumed to be valid). Conducting and completing validity exams and appraisals were estimated to cost about $2,000 per claim, or approximately $262,000 for evaluating all of the federal claims in the Beaver Creek drainage. A minimum and maximum net present value (NPV) was estimated for each valid federal claim in Appendix B-3, primarily to indicate the possible cost to the federal government for buying the mining claims in the Beaver Creek drainage. The estimated minimum and maximum NPV for each claim would be about $12,000 and $335,000, respectively. The estimated total minimum and maximum NPV for all 131 federal claims in the drainage would be approximately $1,572,000 and $44,000,000, respectively.

With Alternative D, it is assumed that the total number of mines with the watershed would decrease from one to zero. Mining expenditures, total output, mining employment, employment effect, mining income, and total income would also be zero. This would cause an unavoidable adverse economic impact; however, the change in total employment and income within the Fairbanks North Star Borough would probably be imperceptible from the current level.

4.11.6 Special Considerations

Cumulative Impacts

Cumulative impacts to the regional economy from mining in the Beaver Creek drainage are projected to be small. Economic contribution is unknown for the period of historic mining. Generally, this contribution is a function of the projected number of mines for each alternative and the investment needed to meet the conditions of approval that correspond to each alternative.

Unavoidable Adverse Impacts

None for the Proposed Action and Alternatives A, B, and C. Under Alternative D there would be a decrease in mining-related employment and income and population in the communities near the Beaver Creek watershed.

Short- Term Uses vs Long-Term Productivity

None for the Proposed Action or any of the alternatives.

Irreversible and Irretrievable Commitment of Resources

None for the Proposed Action or any of the alternatives.

4.12 Mitigation

Mitigation actions are activities which are not specifically required by existing laws or regulations and which can be implemented to avoid or minimize the environmental impacts of a development action. Stipulations are site-specific items which are attached to a permit and are used to implement mitigation.

The Council on Environmental Quality (CEQ) regulations at 40 CFR 1508.20 define mitigation to include actions which:

a) Avoid the impact entirely,

b) Minimize impacts by limiting the degree or magnitude of the action and its implementation,

c) Rectify the impact by repairing, rehabilitating, and restoring the affected environment,

d) Reduce or eliminate the impact over time by preservation and maintenance operations during the life of the action,

e) Compensate for the impact by replacement or by providing substitute resources or environments.

Expected short-term (5-10 years), continuous or long-term (up to 20 years or beyond), and unpredictable impacts are the types of effects that would require mitigation. To provide an appropriate level of mitigation for any impact, the extent and magnitude of the impact on the resource must be known. Figure 4-8 summarizes expected general direct and indirect impacts from mining on various resources. Effects vary as to their direct and indirect nature. All mining activities have a direct impact on the environment. In turn, these direct effects can become secondary change agents, and so on. For example, construction of an access road causes erosion. Erosion contributes to stream

	ACCESS		FACILITIES			OPERATIONS		
	Road Construction	Use of Roads/Trails	Site Clearing/ Filling	Habitation of Facilities	Solid Waste Disposal	Stripping, Mine cuts/fills Settling basins, Stockpiles	Operation of Machinery	Fuel Spills
Geology/ Topography	P – Localized landscape modification	No significant effect	P – Localized landscape modification	No effect	No effect	P – Localized landscape modification	No effect	No effect
Soils	P – Alters/removes upper soil horizon S – Increased sediments S – Reduction of nutrient value S – Potential change in water quality	P – Compacts soils S – Increased water runoff	P – Alters/removes soil structure/reduction of soil nutrient value S – Increased water runoff	P – Compaction of soils S – Increased water runoff	P – Alters soil profile S – Introduces "non–natural" materials to soil	P – Destroys soil structure on site P – Changes particle composition of soil materials P – Increase surface area to erosion	P – Compaction of soils S – Limits vegetation in short term S – Increase water runoff	P – Potential soil contamination
Water	P – Point and Non–Point sediment discharge S – Alteration of chemical water quality T – Altered eco–structure S – Increase velocity of overland flow	S – Point and Non–Point source discharge S – Increased velocity of overland flow	P – Point and Non–Point source discharge S – Increased water temp.	P – Alteration of water chemistry; increased oxygen demand S – Consumptive water use S – Altered eco–structure	P – Increased oxygen demand S – Altered eco–structure S – Potential ground water contamination	P – Increased Point and Non–Point pollution P – Increased sediment bed load/turbidity S – Alt. channel characteristics T – Altered eco–structure	P – Increase soil compaction S – Increased overland flow/ erosion T – Increased sedimentation	P – Petrochemical contamination of surface and ground water S – Alteration of eco–structure
Landcover	P – Removes plants S – Changes revegetation composition	P – Removes plants S – Compresses vegetation	P – Removes vegetation	No effect	P – May alter vegetation composition S – May disallow natural revegetation	P – Removes fine material S – Retards rate of regrowth T – Changes vegetation composition	No significant effect	P – May alter plant composition P – May remove vegetation
Wildlife	P – Habitat loss S – Reduction in numbers	P – Disturbance/disruption S – Alter habitat use T – Reduce available habitat P – Increased harvest S – Reduction in numbers	P – Habitat loss S – Reduction in numbers	P – Disturbance/disruption S – Alter habitat use T – Reduce available habitat	P – Attracts animals S – Removal of nuisance animals T – Reduction in numbers No effect on T + E animals	P – Habitat loss S – Reduction in numbers	P – Disturbance/disruption S – Alter habitat use T – Reduce available habitat	P – Habitat loss (contamination) S – Reduction in numbers
Fisheries	P – Habitat loss S – Reduction in numbers P – Migration barriers S – Reduce available habitat	P – Increased harvest S – Reduction in numbers	P – Habitat loss S – Reduction in numbers P – Migration barriers S – Reduce available habitat	No effect	P – Habitat loss (contamination) S – Reduction in numbers	P – Habitat loss S – Reduction in numbers P – Migration barriers S – Habitat loss P – Suspended sedim./turbidity S – Habitat loss T – Reduction in numbers P – Settleable solids/sediment S – Habitat loss T – Reduction in numbers	No effect	P – Habitat loss (contamination) S – Reduction in numbers
Cultural	P – Physical disturbance S – May detect new sites T – May destroy/lose artifacts	P – Increased access S – May detect new sites T – May lose/remove artifacts	P – Physical disturbance S – May detect new sites T – May destroy/lose artifacts	P – Increased presence of people S – May detect new sites T – May destroy/lose artifacts	P – Physical disturbance S – May detect new sites T – May destroy/lose artifacts	P – Physical disturbance S – May detect new sites T – May destroy/lose artifacts	No effect	P – Physical disturbance S – Contamination of datable material at site
Subsistence	P – Habitat Loss S – Reduction in numbers T – Limits resources to subsistence users only	P – Disturbance/disruption S – Alter habitat use T – Reduction in mumbers Q – Limits resource to subsistence users only P – Increased access S – Increased harvest T – Reduction in numbers Q – Limits resource to subsistence users only	P – Habitat loss S – Reduction in numbers T – Limits resources to subsistence users only	P – Increased presence of people S – Increased harvest T – Reduction in numbers Q – Limits resources to subsistence users only	P – Habitat loss S – Reduction in numbers T – Limits resource to subsistence users only Q – Drinking water contamination	P – Habitat loss S – Reduction in numbers T – Limits resource to subsistence users only P – Turbidity/sediment S – Drinking water contamination	P – Disturbance/disruption S – Alter habitat use T – Reduction in numbers Q – Limits resource to subsistence users only	P – Habitat loss S – Reduction in numbers T – Limits resource to subsistence users only Q – Drinking water contamination
Recreation/ Visual	P – Increased roads/trails S – Increased motorized recreation T – Decreased primitive recreation quality P – Physical alteration S – Linear features disrupt visual scenes	P – Increased access S – Increased motorized recreation No effect on visual resources	P – Increased gravel pads structures S – Decreased primitive recreation quality P – Physical alteration S – Increased visual contrast	P – Increased presence of people S – Decreased primitive recreation quality No effect on visual resources	P – Reduction in numbers of sport hunting animals S – Decreased hunter success P – Increased solid waste S – Increased visual contrast in scene	P – Increased disturbed areas S – Decreased primitive recreation quality P – Turbidity/sediment S – Decreased fishing success T – Decreased floatboating qual. P – Physical alteration S – Increased visual contrast in scent	P – Disturbance/disruption S – Decreased primitive recreation quality No effect on visual resources	P – Reduction in numbers S – Decreased hunter/angler success No effect on visual resources

* P – Primary * S – Secondary * T – Tertiary * Q – Quaternary

Figure 4–8. Summary of general direct and indirect impacts from placer mining activites.

sedimentation. Stream sedimentation reduces spawning habitat for fish. Road construction is the primary change agent, erosion is the primary (direct) effect and a secondary change agent, sedimentation is a secondary (indirect) effect and a tertiary change agent; and finally, reduction in spawning habitat is a tertiary effect (also indirect).

Potential measures suitable for mitigating short-term and continuous or long-term impacts resulting from access, facilities, operations components of the Proposed Action and the alternatives are presented in Figures 4-9, 10, 11, and 12. These figures contain the framework or guidelines for mitigation of mining activities for this stage of the NEPA tiering process. The mitigating measures listed for each mining action component are technically feasible, potential measures; however, specific measures would be adopted after a site-specific environmental assessment is conducted. Thus, the actual application of any mitigation measure can only be discussed and determined within the context of a proposed operation which will be addressed in the EA or EIS prepared for each proposed Plan of Operations.

As a result of this tiering process, alteration of the timing, location, and extent of a mineral development activity may be required to avoid or minimize adverse effects and/or to avoid unnecessary or undue degradation. Tables 9-1 and 9-2 of the Record of Decision for the Resource Management Plan for the White Mountains National Recreation Area (DOI 1986b) lists some crucial/sensitive areas or habitats to be avoided, preferred time frames, and surface or aerial use alterations that may be required by BLM.

Many mitigative measures to replace/reclaim resources that have been altered, removed, or lost as a result of mineral development activities are an inherent part of the Proposed Action and each alternative (Section 2.5). Measures can be incorporated into the restoration techniques required in order to enhance the recovery process of physically altered areas. For example, materials can be sorted by size as part of the mining operation, and the effective use of sorted materials can enhance restoration. This is especially important in previously-mined tailings where no layer of overburden and topsoil is available. Durst (1984) found that revegetation is enhanced if the reshaping reduces the slope of tailings, and their height above the water table. In addition, plants colonize more readily if reshaping leaves a "patchy" landscape that includes low wet spots with gentle slopes and hummocks. In cases where topsoil and/or fines are very limited, better results are generally obtained by spreading these materials in a patchy manner than by evenly spreading them over only part of the area to be reclaimed. The varying degrees and levels of effectiveness of reclamation required by the Proposed Action and each alternative have been incorporated into the analysis and are discussed in their respective sections (Chapter Four).

The success of reclamation varies from site to site and depends on elevation, bedrock geology, aspect, slope, soil, water, and other factors. How each general type of mitigation would work varies from resource to resource. For example, for recreation/visual resources, access could be modified by altering mine access routes to avoid the highlands and Wild River corridor management units. This measure was identified in the White Mountains National Recreation Area RMP and would lessen impacts on primitive recreation opportunities by segregating motorized and non-motorized uses.

The visual contrast of mining facilities could be reduced by painting structures an earth-tone color, which would also lessen the negative impacts to the quality of primitive recreation experiences.

Similarly, revegetation practices such as planting willow shoots to stabilize soils would enhance recovery of shrubs and shorten the duration of habitat loss.

For some short-term and long-term effects, impacts have not been precisely estimated due to their complexity, the lack of site- specific information, or the low probability of their occurrence. Additional information would be required to develop suitable mitigation. The actual impacts would be measured through an impact monitoring program designed to detect changes in biological and/or physical parameters. A monitoring program could be implemented to 1) more accurately determine the impacts to the present resources and conditions and potential future resources and conditions, 2) determine timing, extent, and duration of physical alterations, 3) evaluate the effectiveness of reclamation or replacement, and 4) determine the need for possible modification of previous management decisions. This long-term resource/mining impact monitoring program could be conducted cooperatively by BLM and other agencies/land managers to provide information regarding the effects of mineral development activities, adequacy of mitigative measures (i.e. reclamation) and accuracy of impact predictions. Detection of changes that exceed the maximum acceptable level or threshold (as determined by the regulatory agency or agencies) would trigger a mitigation response plan. This plan can be developed for expected short-term and continuous or long-term impacts, as well as unpredictable impacts.

The timing and location of unpredictable impacts, such as a hazardous material spill, are unknown, so a monitoring program is not feasible. However, implementation of a pre-determined mitigation response plan to contain, neutralize, and clean up the impacted area is necessary. A follow-up assessment of biological impact, reclamation, and replacement could then be implemented. The Alaska Department of Environmental Conservation has prepared a hazardous material spill contingency plan which would be invoked should a spill occur.

Because this EIS will be the "overarching" description of general mitigation, it would be impractical to identify the entire spectrum of potential mitigative measures. As stated previously, specific mitigation depends on many factors such as elevation, geology, soil and slope and the resource which requires protection. Therefore, mitigation is better described and analyzed in site-specific EAs. For examples of site-specific mitigation measures see EAs on McLain (DOI 1988b) and Alaska Placer Development (DOI 1988c). These two operators were granted Limited Intervenor status by the District Court based in part on the data supplied in those assessments.

Figures 4-9, 10, 11, and 12 summarize potential mitigation measures which could be used to avoid, minimize, rectify, or replace resources impacted by placer mining activities. The break down mining activities into three separate components: access, facilities, and operations; present a framework for mitigation of affects associated with these components, and evaluate the effectiveness of the mitigation measures.

ACCESS Potential Mitigation Measures	Effectiveness
Locate crucial/sensitive areas and plan alignments to avoid those areas. eg: (a) Refer to RMPs, other plans for location, analyze in EAs and Plans of Operation, realign access, (b) identify archaeological sites/areas for potential nomination as NRHP sites and mitigate by avoidance of recovery of artifacts (i.e. do a dig), (c) design low water crossings, dikes, dams, bridges to minimize impacts to sensitive areas.	Would avoid or minimize physical alterations, disturbance/disruption of some crucial/sensitive areas.
Alter timing, use, location, extent and design of access. eg: (a) Visual quality assessment conducted as appropriate, (b) disallow overland access except in winter; (c) seasonal stipulation, alter use of area of crucial habitat requirements, (d) use erosion-resistent materials for access road surfacing/maint.	Would avoid or minimize disturbance/disruption of visually and environmentally sensitive areas such as caribou migration routes.
Monitor road/trail use, impacts and incorporate into decision-making. eg: (a) Stipulate seasonal limitations/number of users via permit; (b) refer to existing RMPs, MFPs, EAs, for stipulations/ mitigation measures.	Would provide information about effectiveness of mitigation, accuracy of impact predictions and numbers of users.
Coordinate with other adjacent land management and regulatory agencies that could be impacted by the proposed placer mining activity . eg: (a) Conduct pre-work inspection on site with appropriate representatives from other impacted agencies to ensure all concerns are addressed; (b) establish inter-agency review process. ("one-stop shop")	Would keep other agencies, land managers, owners informed of land use activities.
Conduct class III Cultural Resources inventories. eg: (a) Conduct a zigzag traverse field exam of the area of impact; (b) Conduct a full scale archaeological dig on selected sites.	Would provide better baseline cultural data.

Figure 4-9. Potential Mitigation Measures on Placer Mining Access Impacts.

FACILITIES Potential Mitigation Measures	Effectiveness
Locate crucial/sensitive areas and plan facility locations to avoid those areas. eg: (a) Develop site specific EAs on Plans of operations, which identify and adjust facility location, (b) relocate ancillary facilities to reduce potential visual impacts, (c) relocate ancillary facilities to avoid impacts on environmentally sensitive areas. (d) Relocate ancillary facilities to avoid impacts on archaeological sites, etc.	Would avoid or minimize physical alteration, disturbance/disruption of identified crucial/sensitive areas.
Alter timing, location, design and extent of facility use, depending on site specific EA and Plan of operations analyze facilities to reduce impacts to wildlife, water and recreation eg: (a) Use earth tone paints on facilities to minimize visual impacts; (b) apply seasonal stipulations for facility use to avoid impacts on crucial/sensitive areas.	Would avoid or minimize disturbance/disruption of wildlife, fisheries, recreation, and water resources.
Monitor use of facilities, impacts and incorporate into decision-making during compliance examinations.	Would provide information about effectiveness of mitigation and accuracy of impact predictions.

Figure 4-10. Potential Mitigation Measures on Placer Mining Facility Impacts.

OPERATIONS Potential Mitigation Measures	Effectiveness
Locate crucial/sensitive areas and plan operation locations to avoid those areas. eg: (a) Use low level aerial photography as a tool to identify potential sensitive areas requiring avoidance. (b)Mark (on the ground with pin flags) areas to be avoided.	Would avoid or minimize physical alterations disturbance/disruption of some crucial/sensitive areas.
Alter timing, location, design of stream bypass, extent of operation activities. eg: (a)Construction of bypass during low water season. (b)Identify optimum location for bypass channel to avoid impacts to crucial/sensitive areas, areas of potential archaeological resources, areas subject to subsidence/slumping/slope failure. (c)Design shortest possible bypass to reduce stream gradient/ velocity in order to minimize erosion.	Would avoid or minimize disturbance/disruption of some crucial/ sensitive areas.
Monitor overall operations, impacts and incorporate into decision-making. eg: (a)Conduct multiple compliance inspections during field season to ensure adherence to plan of operation (number and frequency of Compliance Examinations is directly dependent upon area sensitivity). (b)Require water sampling.	Would provide information about effectiveness of mitigation and accuracy of impact predictions.
Reclaim/replace by sloping, respreading fines and topsoil (when available), natural succession.	Would restore 15-60% of land-cover, habitat in 30-50 years.
Reclaim/replace by stabilization to prevent erosion, natural succession. eg: Require placement of water bars/water traps every 75 feet on the contour to reduce sheet flow velocity and entrap sediment.	Would restore 15-25% of land-cover, habitat in 50 years.
Reclaim/replace by shaping, respreading fines and topsoil; fertilize and/or reseed with native species when appropriate. eg: (a)Leave patches or strips of original native vegetation in area of operations to serve as source of seeds and propagules. (b)Introduce beaver into stream valley after cessation of mining. Beaver activities help to reestablish pools and meanders in stream, serve as large catchment ponds to retain organic and other fine grained materials, dams serve as areas where shrub shoots take root to grow, cyclic nature of beaver colonies assists in reestablishment of natural diversity. (dams may cause blockage of fish migrations)	Would stabilize soil and restore 50-60% of landcover, habitat in 25-35 years.
Reclaim/replace by shaping, respreading fines and topsoil, fertilize and/or reseed with native plants. eg: Replant some of reclaimed area with willow shoots 1-2 feet tall. Especially effective near land/water interface. Plant shoots in patchy pattern to approximate original vegetation pattern and diversity.	Would stabilize soil and restore 50-60% of landcover, habitat in 5-15 years.
Reestablish stream channel in original location. Approximate pre-mining length, flow velocity hydaulic gradient, and cross-sectional configuration.	Restore fish habitat, reduce Non-Point erosion, improve visual quality, reduce off-site impacts on stream system.
Zero discharge/100% recycle. eg: Disallow discharge of any process water.	Minimize effects of sedimentation, changes to water chemistry caused by placer mining.

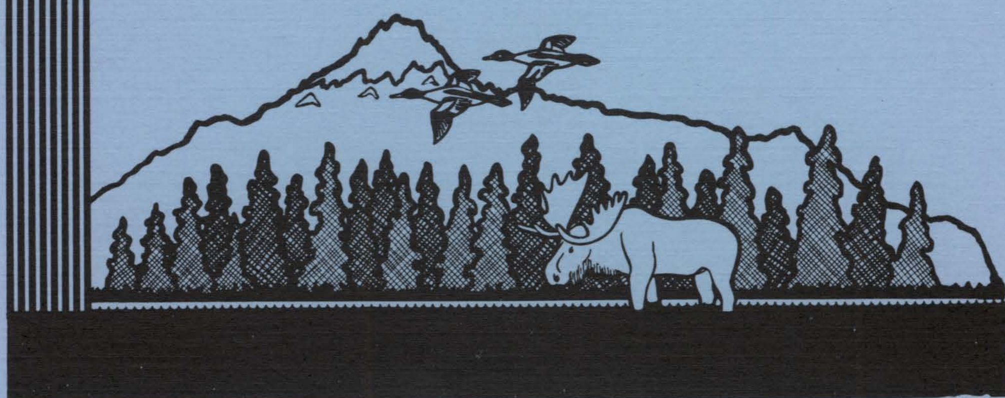
Figure 4-11. Potential Mitigation Measures on Placer Mining Operation Impacts.

Mitigation Measures or Legal Requirements of Other Agencies (Not Comprehensive)	Effectiveness
Dispose of garbage/waste as required by ADEC regulations.	Would avoid or minimize size, extent, and duration of contamination and attraction of bears and other wildlife.
Implement ADEC regulations and response plan to contain, neutralize, and clean up fuel or hazardous material spills/leaks.	Would avoid or minimize size, extent, and duration of contamination.
Compliance with EPA effluent guidelines and State discharge and water quality standards.	Would reduce effects of sedimentation, decrease heavy metal concentrations and temperatures, and increase pH.

Figure 4-12. Mitigation Measures or Legal Requirements of Other Agencies.

Chapter V
Public Participation

Section		Page



BEAVER CREEK

5.1 Introduction

The BLM conducted a broad public and interagency consultation program throughout the development of this EIS, and this input has been incorporated throughout the analysis and document preparation phases. Consultation, coordination, and public involvement have occurred throughout the EIS process through public meetings, informal meetings, contacts with individuals and interest groups, agency meetings and briefings, news releases, and a Federal Register notice.

A public participation plan was prepared to ensure that the public would have numerous opportunities to be actively involved. Both formal and informal input have been encouraged and used. A mailing list was prepared and maintained during the project (see Section 5.4).

Consistency

Coordination with other agencies and consistency with other plans were accomplished through frequent communications and cooperative efforts between the BLM and involved federal and state agencies and organizations.

The State of Alaska Departments of Fish and Game (ADF&G), Natural Resources (ADNR) and Environmental Conservation (ADEC) were sent several copies of the Draft EIS for their review to ensure consistency with State laws, programs, and regulations.

Consultation and Coordination

Members of the EIS team have consulted both formally or informally with numerous agencies, organizations, private companies, and individuals who have indicated an interest in the Beaver Creek Draft Cumulative EIS.

The National Park Service (NPS) is conducting a cumulative study similar to the BLM effort. Several meetings were held to exchange information and ideas regarding these efforts. The NPS and BLM approached the issues of a cumulative EIS in a somewhat different manner due to their different management responsibilities.

The U.S. Army Corps of Engineers is cooperating with BLM in this EIS. There has been a useful exchange of information between the two agencies.

The U.S. Fish and Wildlife Service was solicited for information regarding any listed or candidate threatened and endangered species that may be present in the Beaver Creek drainage. Informal consultation determined that no listd or candidate endangered, or threatened species would be affected.

Several meetings were held with EPA to deal with technical aspects of water quality; these produced information to refine the water quality efforts, this led to several contracts with State of Alaska agencies to assist BLM in data acquisition and analysis (see Appendix A-1). These reports included the topics of water quality, aquatic habitat and fisheries, biologic information, and a review of other consultant reports.

Meetings were conducted with the U.S. Bureau of Mines, ADNR, and the U.S. Geological Survey to update BLM on mineral resources and geology within the study area.

5.2 Scoping

The scoping process conducted by the BLM provided an opportunity for members of the public, special interest groups, the mining industry, and other agencies to assist in defining significant environmental issues. The main objectives of the scoping meetings were:

- To present an overview of this EIS.
- To identify the major environmental issues to be addressed in this EIS.
- To receive comments and questions regarding environmental impact concerns.
- To incorporate those comments and questions into the EIS planning process.

Initially more than 450 letters were sent to the public requesting comments, issues, and concerns to help in setting the parameters of the study, and in developing a mailing list.

The scoping process was initiated for this EIS with the publication of a Notice of Intent to prepare an EIS in the Federal Register on August 18, 1987. The scoping meetings were also announced in local papers and on radio stations throughout the Fairbanks area, in remote communities, and in Anchorage. These announcements resulted in formal meetings in Central, Livengood, Chicken, Fairbanks, Anchorage, and Minto, which were attended by various publics and agencies.

Additionally, a total of 32 written comments were received during scoping (August 18 - October 20, 1987) and concerns were organized into general areas of concern for further evaluation.

Copies of these comments, as well as tapes of scoping meetings are available at the BLM Alaska State Office, 701 C Street, Box 13, Anchorage, Alaska 99513. The general areas of concern cited in public response letters were subsistence, NEPA requirements, reclamation, recreation, water quality, sedimentation, fish and wildlife habitat, economics, legal considerations, research, and engineering. All concerns identified during the scoping process were carefully considered during the development of this EIS.

5.3 Names and Qualifications of Preparers

Both the Draft and Final EIS documents for the Beaver Creek drainage were prepared by an interdisciplinary team of specialists from the Steese/White Mountains and Kobuk District Offices and the Alaska State Office of the BLM. Reviews for accuracy and consistency were provided by the District and State Office staffs as well as key personnel of the U.S. Army Corps of Engineers, Alaska District.

Lynn Anderson, Outdoor Recreation Planner, Bachelor of Science - Outdoor Recreation, 1980, Colorado State University. Four years with BLM, two years with the Forest Service.

Carol Belenski, Visual Information Specialist for seven years. Mapping specialist and printing coordinator for numerous plans.

Kent F. Biddulph, Landscape Architect/Environmental Planning, Bachelor of Arts, 1964, Utah State University, 21 years in Landscape Architecture - Visual Resource Management and Recreation Planning.

Frank Bruno, Writer/Editor, Bachelor of Arts - Journalism, 1974, San Jose State University. Five years with BLM.

Louis Carufel, District Fisheries Biologist, Bachelor of Science - Biology, 1948, St. John's University - Minnesota; Master of Science - Fish and Wildlife Management, 1960, Montana State University. Twenty years of federal service.

Lee Douthit, Subsistence Coordinator, Bachelor of Arts - History, 1967, Texas Woman's University; Master of Arts - Anthropology, 1976, University of Texas at Austin; Ph.D. - Anthropology, 1978, University of Texas at Austin. Seven years with BLM as a Research Archaeologist, cultural resource manager, and subsistence coordinator.

Linda Du Lac, Land Law Examiner, Bachelor of Science - Resource and Recreation Management, 1974, Oregon State University. Nine years with the Forest Service and four years with BLM.

Bruce Durtsche, District Wildlife Biologist, Bachelor of Science - Wildlife Biology, 1978, Arizona State University. Twelve years with BLM. Three years with the State of Arizona.

Richard F. Dworsky, Project Manager, Bachelor of Science - Forestry, 1965, University of Michigan; Masters in Science - Recreation, 1972, Colorado State University; Ph.D. - Forestry, 1986, University of Massachusetts. 20 years in natural resources planning and management. Former Chief of Forestry in Puerto Rico.

William S. Hauser, Mining Engineer, Bachelor of Science - Mining Engineering, 1977, Virginia Polytechnic Institute and State University. 10 years federal service.

Ronald G. Huntsinger, Physical Scientist, Bachelor of Arts - Biology, 1972, Humboldt State University; Graduate studies - Hydraulic Engineering and Watershed Management, Humboldt State University. Fifteen years experience in hydrology, watershed management, aquatic sciences, and undergraduate instruction in biology and physics.

Robert E. King, Anthropologist, Bachelor of Arts - History, 1970, Washington State University; Bachelor of Arts - Anthropology/Archaeology, 1970, Washington State University; Master of Arts - Anthropology/Historical Archaeology, 1973, University of Pennsylvania; Ph.D. - Anthropology/Ethnohistory, 1978, University of Pennsylvania. Six years with BLM. One year Anthropology contract work. Two years author, historian.

Paula V. Krebs, Geographic Information Systems Coordinator, Bachelor of Arts - Zoology, 1965, University of Colorado; Ph.D. - Plant Ecology, 1972, University of Colorado. 22 years experience in landcover/vegetation data production, applied plant ecology projects, ecological analysis and vegetative mapping, and graduate/undergraduate instruction in Botany and Resource Management.

Howard Levine, Land Law Examiner, Bachelor of Arts - Geography, 1981, San Diego State University. Seven years with BLM.

Thomas C. Mowatt, Geologist, Bachelor of Arts, 1959, Rutgers University; Ph.D., 1965, University of Montana. Twenty-five years professional experience in geology, geochemistry, chemistry, and environmental sciences. Includes private sector research and energy/mineral resources exploration-development-production, university teaching-research, state and federal government work. Active professionally in Alaska since 1970.

KJ Mushovic, Land Law Examiner, Associate Degree - Mining Engineering, 1981, Penn State. Five years with BLM.

Kim Pearce, Illustrator, Bachelor of Science, major - Illustration, minor - Biology, 1986. Nazareth College of Rochester, New York. One year with BLM.

Jacob Schlapfer, Land Use Planner, Bachelor of Science - Biology, 1987, Western Oregon State College. One year with the U.S. Forest Service. Two years with the U.S. Fish and Wildlife Service.

Page Spencer, Technical Coordinator, Bachelor of Science - Biology, 1972, University of Alaska - Fairbanks; Masters of Arts - Ecology, 1975, University of Colorado; Ph.D. - Plant Ecology, 1981, University of Alaska, Fairbanks.

John Thompson, Environmental Coordinator, Bachelor of Science - Economics and Political Science, 1975, Dakota State University; Master of Science - Agricultural Economics, 1977, Purdue University. Employed by BLM 1977 to present.

Dave Vogler, Hydrologist, Bachelor of Science - Watershed Science (Hydrology), 1978, Colorado State University. Ten years subsequent professional experience in hydrology.

Susan M. Will, Archaeologist, Steese-White Mountains District, Bachelor of Arts, 1975, University of Alaska at Fairbanks. Nine years with Bureau of Land Management.

Support Personnel

Mike Clark, Cartographic Technician

Debbie Llacuna, Clerk/Typist

Linda Mowatt, Miscellaneous Documents Clerk

Betty Ostby, Land Law Assistant

Aaron Ritchins, Cartographic Technician

Paul Schlepler, Clerk/Typist

5.4 List of Persons, Organizations, and Agencies Reviewing the EIS.

Alaska Congressional Delegation

Frank Murkowski
Ted Stevens
Don Young

Alaska State Government

Alaska Dept. of Commerce and Economic Development
Alaska Dept. of Environmental Conservation
Alaska Dept. of Law
Alaska Dept. of Natural Resources
Alaska Dept. of Policy Development and Planning
Alaska Dept. of Transportation and Public Facilities
Alaska Governor's Office
Alaska Land Use Council
Anchorage District Recording Office
Fairbanks District Recording Office
Fairbanks North Star Borough
Honorable John B. Coghill
Office of the Attorney General
University of Alaska - Anchorage
University of Alaska - Fairbanks

U.S. Government

Assistant Secretary of the Air Force
Department of Energy
National Park Service
Office of Environmental Planning
Office of Environmental Project Review
U.S. Bureau of Indian Affairs
U.S. Bureau of Land Management
U.S. Bureau of Mines
U.S. Bureau of Reclamation
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency
U.S. Fish & Wildlife Service
U.S. Geological Survey
U.S. Forest Service
Secretary of the Army

Organizations

Alaska Center for the Environment
Alaska Federation of Natives
Alaska Legal Service
Alaska Miners Association
Alaska Oil and Gas Association
Alaska Outdoor Council
Alaska Women in Mining
Arctic Audubon Society
Audubon Society
Bering Straits Coastal Management Program
Birch Creek Council
Canada Fisheries and Oceans
Circle District Historical Society
Citizen's Adv. Commission on Federal Areas
Conservation Foundation
Denali Citizens Council
Fortymile Placers
Klondike Placer Miners Association
Mountain State Legal Foundation
Northern Alaska Environmental Center
Pacific Fishery Management Council
Pacific Legal Foundation
Placer Miners of Alaska
Resource Association of Alaska
Sierra Club

Sierra Club Legal Defense Fund
Tanana Chiefs Conference
Trustees for Alaska
The Wilderness Society

Businesses

Alaska Biological Research, Inc.
Alaska Gold Company
Alloy Welding & Machine
Alyeska Oil & Exploration
AMAX
American Rivers
Apocalypse Design, Inc.
Arctic Grayling Guide Service
BTW Mining and Exploration
Bean Ridge Corporation
Beaver Kwit'chin Corporation
Besco, Inc.
Billiton Minerals
Black Velvet Mining
Canada Tungsten Mining Corporation
Clem's Backpacking Sports
Danzhit Hanlaii Corporation
Dickstein, Shapiro & Morin
Dinyee
Dot Lake Native Corporation
Dowl Engineering
Doyon, Limited
Entech, Inc.
Environlab
Environmental Services, Ltd.
Exxon
Fairbanks Exploration
Fraley Equipment, Inc.
George Miller Construction, Inc.
Hart Crowser
Homestake Mining Company
Hungwitchin Corporation
Kachemak Mining Company
Kantishna Mining Company
Knik Kanoers & Kayakers
L.A. Peterson & Associates
Little Squaw Gold Mining Company
Michael Gaughan & Associates

Nerco Minerals Company
Northland Minerals
Parsons, Bahle, Latimer
Ray Wolf Mining
Rife & McMillan
Robertson Mining Company
Russell/Norton/Drovin
SAPCO
Saupe' Enterprises
Seth-de-ya-ha Corporation
T.C.C.
Tanacross, Inc.
Tihteet'Aii, Inc.
Tozitna, Limited
U.S. Borax
Usibelli Coal Mine, Inc.
Warwick & Schikora
WGM, Inc.
Westours
Yukon Quest International, Ltd.

Libraries & Newspapers

Alaska State Library
Alaska Resources Library
Colorado State University Library
Copperas Cove High School Library
Elmer E. Rasmuson Library
Natural Resources Library
Noel Wien Library
Southern Oregon State College
Tundra Times
University of Alaska Library - Anchorage
Z.J. Loussac Public Library

375 Individuals

5.5 Public Review and Comment of Draft EIS

A Notice of Availability was published in the Federal Register on April 15, 1988 (53 FR 12608) for the Beaver Creek Draft EIS. Over 800 copies of the Draft EIS were distributed to agencies, groups, and individuals on the mailing list. A total of five public meetings were held in conjunction with this EIS in Anchorage, Fairbanks, the villages of Beaver and Birch Creek, and Fort Yukon. Subsistence hear-

ings were held in these communities on the same days. The Draft EIS was available for review and public comment from April 18 to June 20, 1988. This allowed the minimum required 45-day period for public comments.

During the comment period, 34 comments were received in response to the Draft EIS from various government agencies, including the State of Alaska Governor's Office, private corporations, special interest groups, and members of the public.

Eleven responders were concerned with water quality within the drainage while 12 were interested in wildlife values. Approximately one-third of the responses favored the standards found in Alternative C and 20% preferred Alternative D.

5.6 Public Comments

All comment letters received by the end of the comment period have been reprinted in the following section. Each letter was assigned a number according to the sequence it was received at the EIS Project office. Responses to the letters are numbered next to the specific comment paragraph (e.g., response 21-13 responds to letter 21, topic or paragraph 13). For accuracy and cost-efficiency, all letters have been reprinted in their original form. The originals are available at the Alaska State Office (918).

We thank everyone who took the time to comment on the Draft EIS. All comments were considered during our review according to the requirements found in 43 CFR 1503.4(b). Some comments required a clarification of the information in the Draft EIS and that information is presented in the responses to the comments. In some cases, text modifications were made as a result of those comments. Other comments pointed out needed changes in the text, and those changes were made. There are no specific responses to comments which did not provide either a clarification, correction, or modification in the text. A matrix of commenters and the issues they raised is provided in Figure 5-1.

Commentors	INDIVIDUAL PREFERENCE FOR- PROPOSED ACTION	ALT C	ALT D		ISSUES AND CONCERNS ECON.	W.Q.	SUBST.	L.C.	WL.	FISH	REC.	VIS.	M.R.	RECL	COMPL	FLD.	PF.	WL.	C.R.	BOND.	E.C.	W.C.
J.B. JACKS			X																			
DR. E.B. ROBINSON , JR,			X																			
BUREAU OF MINES, AK.					X				X				X								X	
BUREAU OF MINES, WDC.					X								X									
CHARLES HAMMOND	X							X	X													
ROBERT WEEDEN		X																				
JAY NELSON		X																				
CLARENCE PETTY			X																			
CHRIS S. TOMICH KENT		X				X				X				X		X						
ARCTIC AUDUBON SOCIETY		X				X								X	X							
ROBIN HAMMOND									X													
CRAIG SCHNORF			X																			
FORTYMILE MINING DISTRICT	X																					
GERALD R. BROOKMAN		X				X								X								
JAMES F. DEVINE																	X					
MIKE & DIANE FRANK			X																			
LOWELL KRASSNER			X																			
DAVE LACEY (DINYEE)		X																				
MRS. FRANK HUTTON		X																				
HARRY E. WILSON			X																			
N. AK. ENVIRN. CENTER		X			X	X		X	X	X	X										X	
EPA					X	X	X	X	X	X	X		X		X			X			X	
PACIFIC LEGAL FOUNDATION	X				X	X			X	X												
NATIONAL PARK SERVICE					X	X	X		X	X		X	X	X					X			
STATE OF ALASKA					X	X	X		X	X				X							X	
U.S. FWS						X	X	X	X	X								X			X	
CITIZENS ADVISORY COMM.	X						X															
MARK LUSCH		X	X								X			X								
JEFF & SUSAN SLOSS		X																				
BRIAN ALLEN		X																				
DONALD C. PENDERGRAST		X				X					X											
KEN ZAFRAN		X																				
STEVE TUCKER, M.D.					X						X											
SIERRA CLUB LEGAL DEF.		X												X	X	X				X	X	X

KEY FOR ABBREVIATIONS --

ECON. = ECONOMICS	FISH. = FISHERIES	COMPL. = COMPLIANCE	BOND. = BONDING
W.Q. = WATER QUALITY	REC. = RECREATION	FLD. = FLOODING	E.C. = EDITORIAL COMMENTS
SUBST. = SUBSISTENCE	VIS. = VISUAL	P.F. = PERMAFROST	W.C. = WORST-CASE
L.C. = LANDCOVER	M.R. = MINERAL RESOURCES	WL. = WETLANDS	
WL. = WILDLIFE	RECL. = RECLAMATION	C.R. = CULTURAL RESOURCES	

Figure 5 – 1. Commentors and Areas of Response Matrix.

J. B. JACKS
S.10 W 31357 IRWIN CT.
WALES, WI 53183

Richard Dworsky
BLM- Alaska State Office
Box 13
Anchorage, AK 99513

Dear Mr. Dworsky:

I read in the Federal Register that you are preparing an EIS on placer mining in Beaver Cr. Drainage of the White Mt. NRA.

I object to the "No Mining" alternative. All public lands now legally available for mining should be left that way and not taken off the mining base. Congress and Federal land management agencies have already removed so much of this land that it may no longer be possible to provide adequate availability of mineral resources to the public.

Mining impacts are usually very small and of short duration ... and benefits to taxpayers are <u>Very</u> high! If Congress has left these areas open to mining, then let it happen!

J B Jacks

2 Staedler Lane
Elmwood Park, NJ 07407
May 7, 1988

Beaver Creek EIS
Bureau of Land Mgt.
701 C Street
Anchorage, Alaska

Attention: Richard Dworsky

Dear Mr. Dworsky:

This letter is my comment on the Beaver Creek Environmental Impact Statement.

I advocate Alternative D, the "no mining" alternative.

Sincerely,
Dr. E.B. Robinson, Jr.

United States Department of the Interior

BUREAU OF MINES
Alaska Field Operations Center
201 E. 9th Avenue
Suite 101
Anchorage, Alaska 99501

May 11, 1988

Michael J. Penfold, State Director
Attention: Richard Dworsky, Project Manager
Bureau of Land Management
Alaska State Office
701 C Street, Box 13
Anchorage, Alaska 99513

RE: Beaver Creek Draft Cumulative Environmental Impact Statement (DCEIS)

Dear Mr. Dworsky:

Thank you for the opportunity to review the Beaver Creek DCEIS. Overall, the document represents a substantial effort and the BLM should be congratulated on having completed it in the timeframe allowed.

Because of the importance of this DCEIS and others which you are working on (Birch Creek, Fortymile River, and Minto Flats) I asked the Bureau's Division of Policy Analysis (DPA) in Washington, D.C. to review the document. DPA is currently working on a Potential Supply Analysis study of the White Mountain National Recreation Area (WMNRA), the results of which may have application to your DCEIS efforts. Those comments are attached.

The Alaska Field Operations Center recently completed Open File Report 5-88 summarizing 1987 field studies of the placer deposits in the WMNRA (attached). A second report by Mike Balen concerning the feasibility of placer mining in the same area has been sent to Washington, D.C. for approval. A preliminary copy can be made available to you if you are interested in this information. An assessment of undiscovered placer resources in the WMNRA was completed by the ADGGS and Bureau in November 1987. Results are available from Bob Adams, DPA, Washington, D.C. (FTS 634-1036). **3-1**

Specific comments and questions concerning the DCEIS are as follows:

Introduction

Proposed Action - Consequences, pg. 4, first paragraph: "This acreage would be an irretrievable and irreversible loss of vegetation resources." Why irretrievable an irreversible? It is also unclear where the reclamation figures were derived from (e.g. 676 acres impacted, 115 acres of moose habitat loss over a 50 year period). **3-2**

3-3 Proposed Action - Consequences, last paragraph: Five mines would accrue a total of $1.8 million in water treatment and reclamation costs over the 10 year period (5 mines x ($26,000 + $10,000) 10 years = $1,800,000. If the mines will recover only $500,000 in gold during that period, why would they bother to operate? This comment applies to alternatives A - C also.

3-4 Alternative A - Consequences, first paragraph: This number is derived... Which number is referenced here?

3-5 Alternative D - Consequences, second paragraph: Vegetation appeared to be quite healthy in Birch Creek drainage when the Bureau visited the area in June 1987. Evidence of a healthy moose population also existed. Why is the acreage impacted by previous mining irreversibly and irretrievably lost.

3-6 Alternative D - Consequences, fourth paragraph: $3,000 in annual wages seems low. How were these calculated?

3-7 Economic impacts are not well described, see DPA comments.

3.2 Mineral Resources

3-8 Pg. 3-9, first paragraph: Reference to Bureau's placer studies (OFR 5-88) in the WMNRA should be made.

3-9 Pg. 3-10 photo: This photograph misrepresents placer mining activity in the Beaver Creek drainage.

3-10 Pg. 3-11, third paragraph: Gold resource figures here do not agree with figures used in introduction (alternative consequences) i.e. $500,000 of total production under Alternative A equals 1250 oz. at $400 gold. The Bureau's OFR 5-88 contains additional identified resource information and DPA has information on undiscovered resources.

3.2.1 Mining in the Study Area

Most of the information in this section does not pertain to mining in the study area, but rather what is being done by other agencies to mitigate water quality problems and other impacts from placer mining.

Please feel free to contact me at the above address if you have any questions.

Sincerely,

Robert B. Hoekzema

Robert B. Hoekzema
Chief, Anchorage Branch

Attachment

cc: P. Gates M. Gloster
W. Miller R. Adams

RBH:cto:1210M

3 Continued

United States Department of the Interior

BUREAU OF MINES
2401 E STREET, NW.
WASHINGTON, D.C. 20241

May 3, 1988

Memorandum

To: Chief, Alaska Field Operations Center

Through: Deputy Associate Director--Information and Analysis HE

From: Chief, Division of Policy Analysis

Subject: Comments on Beaver Creek Placer Mining Draft Cumulative Environmental Impact Statement

In response to your request, the attached document contains our comments on the subject draft EIS.

Stanley Miller

Attachment (2)

3 Continued

Comments on the Bureau of Land Management's
Beaver Creek Placer Mining Draft Cumulative
Environmental Impact Statement

The Beaver Creek draft environmental impact statement (EIS) was prepared by the Bureau of Land Management (BLM), in part, to address the requirements of an order by the United States District Court for the District of Alaska to consider the cumulative impacts of placer mining on the Beaver Creek watershed. The significance of this EIS is that it is the first time that cumulative impacts are to be considered. As a result, it is important that the implications of this new focus be fully considered and that the analytic techniques used to define and estimate the cumulative impacts are based on correct principals and complete scientific, engineering, and economic information. If this is not done, it is quite possible that the new focus on cumulative impacts could lead to public policies which inadvertently and/or incorrectly distort the balance between economic development (including mineral development) and environmental protection of resources on Federal lands.

While this draft EIS places heavy emphasis upon defining and analyzing the cumulative, as well as incremental, environmental impacts of placer mining, the cumulative economic benefits of placer mining are inadequately considered. The discussion of undiscovered placer gold resources is very confusing and it is virtually impossible to find an estimate of the cumulative value of placer gold resources remaining to be discovered and produced from the subject area. It is this value along with the cumulative value of known resources remaining to be produced which should be presented as the basis of any estimate of the cumulative economic benefits of allowing mineral development in the area and would be comparable, in concept, with "cumulative environmental impact." This

3 Continued

estimated mineral value information should then be used to estimate the direct and indirect impacts upon incomes, employment, and tax revenues in the regional and State economies as another indication of the cumulative economic benefits of mineral production. To the extent that these potential economic benefits are foregone as a result of one of the alternative plans considered in the EIS, they should be clearly presented as part of the costs of that plan. The Bureau of Mines is currently completing an economic evaluation of the undiscovered mineral resources of the White Mountain Recreation Area which will provide the types of economic information suggested above. This information should be incorporated in the EIS in partial fulfillment of the requirement of the District Court of Alaska to address cumulative impacts of mineral development. 3-11

On page 4-58 of the draft EIS, paragraph 4.12, the statement is made "The description of economic impacts does not include indirect impacts to employment, income, and population because data are not available." As indicated in the preceding paragraph, the Bureau of Mines now has the capability to generate this information for the area in question and will be happy to do so if time allows.

The draft EIS contains a number of pictures from the Anchorage Museum of History and Art which are interesting from a historical perspective but which create a very negative image of mining in the reader's mind. The picture on page 3-10, showing a placer operation from many years ago, should be replaced with a picture more relevant to the subject of the EIS. A picture of a modern placer mining site operating under proposed environmental and reclamation standards would be far more appropriate and would avoid the negative bias against mining created by the picture currently being used. 3-12

3 Continued

3-1 Information was requested from Bureau of Mines, but was not received in time to incorporate in this EIS.

3-2 First question: The analysis of "irreversible and irretrievable" are required under CEQ regulations (1502.16). Some acreage which has been placer mined remains barren or sparsely vegetated for a long period of time. In the Nome Creek dredge tailings, 300 acres of 350 disturbed acres remain barren or sparsely vegetated 40 years after mining. This ratio (85%) was used to project acreages of barren dredge tailings for evaluating the Proposed Action and alternatives. See Appendix D-1 and Section 4.5 for further explanation.

Second question: See Appendices for methodologies, especially B-1, D-1, and Section 4.6.

3-3 This inconsistency has been corrected in the FEIS. The $500,000 in gold value was an <u>annual</u> estimate.

3-4 The number of mines (4).

3-5 Comment noted, text corrected to show 300 acres. See response 3-2 above.

3-6 Text clarified: Summary, Alternative D

According to Hagler, Bailey and Co. 1987, labor expenditures divided by the number of person-months worked in the Beaver Creek/Minto Flats drainages averaged $1,130 per workmonth. Only one Beaver Creek placer mine is known to have operated in 1987 and employment was estimated between two and three workmonths because of a late start. Therefore, labor expenditures for this operation were estimated at about $3,000.

If one assumes eight workmonths per mine, per year, then total labor expenditures would amount to about $9,000 per year.

3-7 The economics data for the EIS has been revised with additional material provided by the BOM. See Sections 3.11 and 4.11 for revision.

3-8 A reference to Bureau of Mines OFR 5-88 has been made in the text (Section 3.2) and the bibliography of the Beaver Creek EIS.

3-9 This is a historical photo of interest to the general public.

3-10 The gold production figures were inadvertently included in the Summary and do not coincide with the gold resource figures. This has been corrected.

3-11 Information was requested.

3-12 Comment noted; see response 3-9.

May 18, 1988

To whom it may concern,

After reading through the draft E.I.S. for the Beaver Creek drainage, I have the following comments.

I support "Alternative A" as the most viable solution ~~the~~ to and for the Beaver Creek drainage. It addresses the most reasonable approach.

BLM's "proposed action" (status Quo) would be acceptable if it incorporated a 'mixing zone' of 500' down stream when sampling for turbidity. **4-1**

I do not, in any way, support alternate's "C" or "D" and find that they would unduly suppress the ability for the miners in that area to make a living.

Sincerely,
Charles R. Hammond

Charles R. (Dick) Hammond
Gen. Del.
Chicken, Alaska
99732

4-1 Text has been clarified. BLM's intention is to comply with water quality standards via permitting from other agencies.

The State of Alaska has the responsibility for determining when or if a mixing zone variance will be allowed. See 18 AAC 70.032 for details of how one can apply for a mixing zone variance from the State.

Jay Nelson
1711 Bellevue
Anchorage, AK
99505

Dear Sir:

I am writing in regard to the Beaver and Birch Creek NWR EIS. I would like to submit these comments.

As an advocate and personal fan of clean water, I would like to endorse the reclamation alternatives under "C." Mining should be carried out so as to cause only minimal damage; reclamation should be certain and swift. These rivers were designated "wild" for their outstanding environmental qualities and any management plan should protect those values first and foremost.

Thank you for this opportunity to comment.

Sincerely

Jay Nelson

R.D. 4, Box 348
Canton, N.Y. 13617
June 6, 1988

Beaver Creek/Birch Creek EISs
c/o Richard Dworsky
Bureau of Land Management
701 C Street, Box 13
Anchorage, Alaska 99513

Dear Mr. Dworsky:

Please make this letter part of public hearing record on the Beaver Creek, Birch Creek EIS.

The highest priority should be protection of the natural resources in the Steese-White Mountains area and if this is not established as policy, the "no mining" alternative should prevail.

All state and federal quality standards for these two streams should be met with no degradation allowed in the quality of the water.

6-1

If mining is allowed to continue, the reclamation practices outlined in Alternative C should be followed to ensure that full recovery of the water system to its pre-mining condition will be achieved as rapidly as possible.

The final recommended alternative should conform to the purposes and management specified for the Steese National Conservation Area, the White Mountains National Recreation Area and the National Wild Rivers system. The current EISs fails to do so.

6-2

It is apparent that the EISs failed to indicate the substantial benefits derived from proper reclamation proceedures and this should be corrected.

The "Proposed Action" clearly gives the top priority to mining instead of the other uses for which the area was designated and is therefore unsatisfactory.

Sincerely,

Clarence Petty

Clarence Petty

6-1 See Section 1.6 for discussion of valid existing rights.

6-2 See Sections 4.3-4.7 for further discussion. The effects of various reclamation standards.

June 10, 1988

Beaver Creek/Birch Creek EISs
c/o Richard Dworsky
Bureau of Land Management
701 C Street, Box 13
Anchorage, Alaska 99513

Dear Mr. Dworsky:

I am commenting of the Beaver Creek and Birch Creek Draft Environmental Impact Statements evaluating the cumulative effects of multiple placer mining operations on these watersheds.

I am concerned with the BLM overrated value of mining and disregard for riparian resources. Both Beaver and Birch Creek have been recognized as considerable National treasures. Designated as National Wild Rivers, these rivers are among the last great rivers unaltered by the works of man. Standing on the banks of a wild river, to me, thrills the soul with the spirit of the land. The values that the casual visitor to these rivers experience can not be expressed in a monetary amount. However, trends towards increasing tourism aimed at experiencing the wild rivers of Alaska are increasing. Our rivers, our natural habitat represent a lasting and permanent resource to the people of Alaska and this Nation. This resource will be for our children's children as long as we manage our resources carefully.

The draft Environmental Impact Statement on the cumulative
effects of mining places little value on the riparian resources
disturbed by the placer mining process. The document ignores
the fact that much of the disturbed area will remain
7-1 unstabilized, eroded, and will cause long term disturbances to
wildlife of the area. Placer mining is not the romantic image of
the old prospector and gold pan. Small one man operations with
the aid of mechanization can turn riparian habitat into piles of
unvegetated gravel.

To manage these National Wild Rivers as a resource the BLM
must recognize the benefits of careful reclamation, and "zero
discharge" of water quality treatment systems. Requiring
diligent reclamation of disturbed areas nurture the growing
interest by the visiting public to see how modern mining
practices are not pillaging resource practices. The mining of
gold only benefits those that mine. It is not a critical
material for the survival of mankind. The vast majority of gold
sits in banks around the world. The use of public resources for
7-2 the sole benefit of a few users should not be emphasized.
National Wild rivers are designated because of their outstanding
contribution to the heritage of Man.

The BLM in the study of cumulative impacts must consider the impacts arising from all phases of the mining process. Cumulative effects of spillage of petroleum products have a significant impact on aquatic environments. Operators of placer mining sites should be equipped with absorption pads to minimize accidental petroleum releases. 7-3

Use of potential environmental hazards including leachate and mineral chelate chemicals must be regulated to prevent their release into the environment. The practice of "zero discharge" will allow more extensive areas to be mined as well as protection of downstream riparian resources.

The discharge of fine river sediments can suffocate aquatic insects. High turbidities and fine sediments reduce the viable habitat for native fish species and developing smolts. Fine sediments increase the chemical dissolution of naturally occurring minerals, arsenic being the most recognized native mineral associated with Alaska placer mining.

Discharge of fine sediments over the mining seasons void the washing effect that spring breakup and high water discharges have on river gravel. These high flows remove the naturally occurring sediments that would otherwise reduce habitat for native species of fish. Year round discharges of fine sediments create large plumes of suffocating material that impact the river during the critical periods of summer growth.

Water quality control measures must be designed to fully comply with all state and federal water quality standards and permit limitations. BLM must protect the values of these National Wild Rivers by not allowing any degradation of water quality. I urge the BLM to adopt the reclamation practices defined in Alternative "C". This alternative maximizes recovery of mined areas and returns mined streams to productive fisheries habitat within a reasonable time frame. 7-4

I urge BLM to comply with the purpose and management mandates for the White Mountains National Recreation Area, the Steese National Conservation Area and The National Wild Rivers within them. The protection of recreation and conservation must be given a priority over mining.

Thank you for allowing me to comment on this draft plan.

Sincerely,

Chris S. Tomich Kent
P.O. Box 20571
Juneau, Alaska 99802-0571

7 Continued

7-1 See discussion of riparian habitat (Sections 3.5 and 4.5) and wildlife use f(Sections 3.6 and 4.6).

7-2 See Section 1.6 for discussion of valid existing rights and multiple use.

7-3 See Section 3.4.3 for discussion of fuel spills.

7-4 State water quality standards and federal effluent limitation guidelines are enforced by ADEC and EPA.

10 June 1988

BLM
701 C Street, Box 13
Anchorage, AK 99513

Comments RE BEAVER CREEK and BIRCH CREEK EISS

In my role as Conservation Chairperson of the Arctic Audubon Society, I responded at some length to these two Placer Mining EISs. The purpose of these comments is to express my personal concern and dismay that BLM has chosen, as its proposed management action, an alternative that will result in degradation of water quality, non-compliance with state water-quality standards, and grossly inadequate watershed rehabilitation.

I wish to go on record as endorsing the comments of the Northern Alaska Environmental Center in support of ALTERNATIVE C. Clearly, I am not signing on blindly. I have read and studied the Birch & Beaver Creeks EISs and have informed myself as to the technicalities of these issues. I concur that the purposes for which the White Mountains and Steese units were established are not addressed in the Proposed Action. Mining, within these units, is a secondary use: it is to be "consistent with the protection of the scenic, scientific, cultural, and other resources of the area...." BLM's Proposed Action does not provide this requisite level of protection.

Only by requiring zero discharge/total recycle (Alternative C) can cumulative impacts of multiple mining operations be prevented. Only by requiring maximum reclamation efforts, including respreading overburden and fines, can soil stability and re-vegetation on disturbed mine sites be established. Restoration of soil stability is essential to prevent continued sediment erosion into the streams, which would continue water quality degradation beyond even the period of active mining. **8-1**

Nor should cost of compliance with environmental regulations be used as an excuse to relieve miners of the burdens of operating in an environmentally-sound manner. To do so ignores the other side of the economic coin: the benefits, to residents and recreationalists alike, of clean water, productive fisheries, and stable soils. By endorsing a management plan that fails to mandate the soundest possible environmental practices, BLM has abdicated its responsibilities as the nations's chief land management agency.

I therefore urge the BLM re-think its Proposed Action and to adopt Alternative C.

Sincerely,

June Weinstock

June Weinstock
1339 6th Avenue
Fairbanks, AK 99701

8-1 See Section 1.6. BLM has the authority and responsibility, as set forth in FLPMA and further defined at 43 CFR 3809, to manage the public lands so as to prevent "unnecessary or undue" degradation to the environment. This is the standard by which BLM manages mining activity in the White Mountains NRA. BLM ensures that mining does not significantly impair the values for which the NRA was established, while not interfering with legitimate mining operations.

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Steese/White Mountains District Office
1541 Gaffney Road
Fairbanks, Alaska 99703-1399

Rec'd [illegible] 5/27/88

IN REPLY REFER TO:
1784 (975E)

May 19, 1988

To: Michael J. Penfold (910)

From: Donald E. Runberg, District Manager (080)

Subject: Joint Resolutions of the Northern and Southern Advisory Councils

Attached are the eight resolutions addressed by the Advisory Councils at their joint meeting on May 10 and 11. All were passed by both councils except number 3, which was withdrawn before a vote.

Since several of these resolutions request action at the state office level or higher, I am forwarding them to you for consideration and action.

The minutes are being prepared and will be forwarded to you by June 8.

Donald E. Runberg

1 Attachment
  Attch 1 - Joint Resolutions (8 pp)

cc: Gene Terland, Acting DDM/Southern Council
John Rumps, DDM/Southern Council
Bob Arwezan, Acting Chair/Southern Council
Hope Nelson, Chair/Southern Council
June Degnan, Vice-Chair/Southern Council
Woodrow Johansen, Chair/Northern Council
Gary Lee, Vice-Chair/Northern Council

Public Lands USA: Use, Share, Appreciate

Resolution from
the Joint Meeting
of the
Northern & Southern Alaska Advisory Councils
May 10 & 11, 1988
Fairbanks, Alaska

#4 - Resolution drafted by John Sims Passed/both Councils

WHEREAS, the BLM has been required by the U.S. District Court (District of Alaska) to prepare cumulative environmental impact statements assessing the impacts of placer mining on the Beaver Creek, Birch Creek, Fortymile River and Minto Flats drainages; and

WHEREAS, the draft cumulative EISs for the Beaver Creek and Birch Creek watersheds have recently been released; and

WHEREAS, the "proposed action" (i.e., preferred action) identified in the draft cumulative EISs allows for placer mining to occur within a framework of appropriate and adequate protection of the environment; and

WHEREAS, the "proposed action" recognizes that placer mining is a needed and valuable economic activity on the public lands; therefore

Be it resolved that the Northern and Southern Alaska Advisory Councils commend the professional staff of the BLM for the timely completion of the EIS drafts which thoroughly address the charges of the court.

Be it further resolved that the Northern and Southern Advisory Councils hereby endorse the preferred alternative identified in the draft cumulative EISs for Beaver and Birch creek watersheds.

Attch 1-4

9 Continued

6-10-88

Mr. Dworsky,

I'm writing about the Brown Creek EIS. I strongly support "Alternative A" as the only viable option.

Also, I want to argue about the statements throughout the EIS that mining decreases moose habitat for 30 years. I know that every mining site is different, but many have little quality moose habitat to start with, and most disturbances in Alaska (such as mining cuts + road cuts) greatly encourage willows, as part of succession. Because willows are the primary browse for moose, moose habitat is increased in these areas. It is in the nature of willows to be aggressive, rapidly growing plants and almost any mining cut 10 or 15 years old shows this phenomenon quite well.

Sincerely,

Robin Hammond

Robin Hammond
Chicken, AK. 99732

DEAR MR DWORSKY,
I JUST RECEIVED WORD THAT EIS'S FOR BEAVER CREEK AND BIRCH CREEK ARE OUT. IT SEEMS THAT THE ALTERNATIVE THE BLM HAS CHOSEN WILL NOT HAVE LEGAL EFFECTS UNDER CURRENT LAW. IT IS OBVIOUS THE ONLY PROPER ALTERNATIVE IS THE NO MINING ALTERNATIVE.

HAVE A GOOD DAY,

Craig Schnorf

CRAIG SCHNORF
POBOX 486
VALDEZ, AK
99686-0486

715 Muir Avenue
Kenai, Alaska 99611
June 13, 1988

Beaver Creek/Birch Creek E.I.S.s
c/o Richard Dworsky
Bureau of Land Management
701 C Street, Box 13
Anchorage, Alaska 99513

Dear Mr. Dworsky:

I was unable to attend the public hearing held on the subject of the Beaver Creek and Birch Creek Environmental Impact Statements. I am, therefore, submitting this letter in lieu of an oral statement at that public hearing, and I request that it be entered into the formal public hearing record, and given the same consideration as if it had been offered as oral testimony at that public hearing.

I believe that a legal imperative exists, that these areas be managed in full accord with the purposes and management mandates for the White Mountains National Recreation Area, and the Steese National Conservation Area and the National Wild Rivers within them. That is to say, in any situation where there may exist, or come to exist, a conflict between mining and recreation and/or conservation values, the recreation and/or conservation values must be given precedence. I believe that the current Proposed Action is clearly in conflict with this mandate, and should be rewritten to make it clear that mining activities shall not be permitted in any situation in which they may be detrimental to recreation and/or conservation, in the subject areas.

I disagree with, and object to, the conclusions of the draft E.I.S.s which downplay the benefits that would be gained through implementation of full reclamation practices and water quality control measures. I would like to point out that data included within the E.I.S.s indicates major differences in site recovery and impacts to aquatic systems, depending on which alternative is implemented.

I urge the adoption of the reclamation practices defined under Alternative C. I believe that these practices are completely reasonable, and are the minimum necessary under the circumstances.

I insist that water quality control measures be designed to fully comply with all state of Alaska, and Federal E.P.A. water quality standards and permit limitations. The B.L.M. must act affirmatively protect the values of the two National Wild Rivers which are within the area encompassed by the subject E.I.S.s, by not allowing any degradation of their water quality. This will, in some cases, require the implementation of "zero discharge" water quality treatment systems.

12

Should the B.L.M. fail to require the provisions which I have described on page one of this letter, I believe that the only legal and reasonable alternative would be no mining at all permitted in the geographical area encompassed by the Beaver Creek/Birch Creek E.I.S.s.

Sincerely,

Gerald R. Brookman

Gerald R. Brookman

12 Continued

United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VA 22092

In Reply Refer To:
WGS-Mail Stop 423

JUN 10 1988

Memorandum

To: Project Manager, Bureau of Land Management, Anchorage, Alaska

From: Assistant Director for Engineering Geology

Subject: Review of draft environmental statement for Beaver Creek placer mining, Alaska

We have reviewed the statement as requested in your letter of May 2, included in the document.

We suggest that the analysis should address the potential effects of placer mining on the ground-water regime and related permafrost. For example, the effects of ripping permafrost-indurated sediments should be addressed. Will there be situations where subpermafrost or intrapermafrost ground water may be released--perhaps under some pressure? If so, effect on ground-water quality and related surface-water quality should be addressed. The statement should also evaluate the effects of 33.4 miles of permanent roads on permafrost and shallow ground water. 13-1

for James F. Devine

Copy to: District Chief, WRD, Anchorage, Alaska

JUN 17 8 52 AM '88
BLM AK SO 950

13-1 The comments represent excellent points regarding details and mechanisms of ultimate concern to placer mining in terms of ground water and related permafrost. Considerations precluded in-depth investigation of these aspects, as well as numerous others in various other technical sub-disciplines. Although of fundamental value in understanding complex relationships, such detailed analysis generally is deferred to subsequent management activities, on a case-by-case basis. Ground water resources are not of concern in terms of the cumulative impacts of the relatively moderate levels of mining in the Beaver Creek watershed. Should this situation change, for a particular stream/reach/area, further work, as per the reviewer's comments, would be considered, as appropriate, on a site-specific basis. Permafrost is discussed in Sections 3.3 and 3.4.2.

June 15, 1988

Dear Mr. Dworsky:

In our view neither the Beaver Creek nor Birch Creek EIS adequately discusses the impact of mining as it relates to the primary purpose of Congress in creating these two wild river corridors: the protection of recreation and conservation values. Seen solely from an economic perspective, the recreation economic value of the rivers far outweigh the incidental (jobs, minuscule tax collections) economic value to the state and nation of mining on the rivers. We therefore object to BLM's Proposed Action Alternative. We endorse the practices proposed in Alternative C (e.g., reclamation), altho' we prefer no mining if it means "reclamation" is thereafter a necessity. At a minimum, BLM must take stringent action to ensure state and federal water quality standards are met on all mines covered by the EISs. There are mines in the state who have undertaken "zero discharge" to meet those standards, and no less should be expected of competing mines, and miners, elsewhere. 14-1

Again, we are disappointed that BLM's Proposed Action Alternative inconsistently recommends less than stringent safeguards with respect to mining, and its potential

negative impacts on recreation values and conservation values, when the purpose these two rivers were made national wild rivers was to serve those two values not private economic interests of mining claimants.

Thank you for taking into account our thoughts.

Mike & Diane Frank
2224 Turnagain Parkway
Anchorage, Alaska
99517

14 Continued

14-1 See response 7-4.

Lowell Krassner
24 Beacon Street
South Burlington, Vermont 05403
June 16, 1988

Mr. Richard Dworsky
Bureau of Land Management
701 C Street, Box 13
Anchorage, Alaska 99513

Dear Mr. Dworsky,

I am writing to comment upon the EIS for placer mining on the Beaver Creek and Birch Creek National Wild Rivers. It is disgraceful to consider defiling these wild rivers with destructive erosion from mining operations. I have seen the outrageous conditions at the Kantishna Camp in Denali National Park, and oppose their extension to other rivers, especially ones which Congress has given special protective designation.

To whatever extent possible, the BLM should prohibit placer mining within the drainages of these two National Wild Rivers. I favor a "no mining" alternative, for this is the surest way to fulfill the goals of wild river designation, which is an obligation of BLM under the law. Protecting the White Mountains NRA and the Steese NCA, as well as the wild rivers, is BLM's primary and overriding responsibility. If there is a choice betweeen mining and protecting fish, wildlife, scenery, and conservation and recreation values, mining must be excluded.

BLM AK 930 950
JUN 20 1 30 AM '88

If it is legally impossible to preclude placer mining in these drainages, the BLM should assure that the highest standards are enforced to preserve water quality, fish, and stream banks. This means applying the reclamation practices of Alternative C to any mining operations. All mining operations should be required to implement "zero discharge" water quality treatment systems.

It is especially important that the fine materials removed in mining be replaced when operations are completed. Restoring these materials critically important to recovery and restoration of vegetation, and to minimizing siltation.

I hope that the BLM will reconsider the pro-mining bias evident in its proposed action and in the draft EIS, and will carry out its legal mandates to protect the special conservation areas and wild rivers which Congress has designated.

Yours truly,

Lowell Krassner

Lowell Krassner

Dinyee
P.O. Box 1372
Fairbanks, AK 99707-1372

June 16, 1988

Beaver Creek/Birch Creek EIS
C/O Richard Dworsky
BLM
701 C Street, Box 13
Anchorage, AK 99513

Dear Mr. Dworsky:

Dinyee is writing to give comments on the Beaver Creek and Birch Creek draft EISs. We are opposed to the Proposed Action because of its impact on water resources and wildlife habitat. This should not happen in the White Mtns which are a set-aside recreation area. Dinyee is concerned that the heavy metals and other pollutants from unsound mining practices will negatively impact the fishery on the Yukon River. We support Alternative C because of the reclamation practices required. Reclamation and water quality control measures are necessary to protect the downstream fishery and wildlife habitat. Dinyee has no problem with mining as long as it is done right. The externalizing of costs down the river is not doing things right. Mining is another industry that must mature and come into the 20th Century. We can no longer tolerate 1872 mining practices. There is no excuse for poisoning the rivers for profit. The subsistence, recreation, and tourism should not have to pay for these externalized costs.

Thank you very much for your time and consideration.

Cordially,

Dave Lacey

Dave Lacey
General Manager
Dinyee

June 12, 1988

Bureau of Land Management
c/o Richard Dworsky
701 C Street, Box 13
Anchorage, Alaska, 99513

Dear Mr. Dworsky: Re: Beaver Creek/Brich Creek EISs

If there is to be placer mining on federal lands, it must be conducted in the most environmentally sound manner possible from the very first stages. Prevent damage before it begins. It is the economical way in the long run to protect the land, water and wildlife. Laws and regulations to ensure this must be properly implemented and enforced.

17-1 The current Proposed Action must be rejected as it definitely facilitates mining to the detriment of the legally mandated public uses of the areas. The final recommended alternative must be constructed to fully comply with the purposes and management mandates for the White Mountains National Recreation Area, the Steese National Conservation Area and the National Wild Rivers within them. Protection of recreation and conservation values of these areas must be given priority over mining in any areas where conflicts may exist.

Data included within the EISs point out major differences in site recovery and impacts to acquatic systems depending on which alternative is implemented. Benefits which can be gained through implementation of full reclamation prectices and water quality control measures must not be downplayed or ignored.

The reclamation practices under Alternative C should be implemented for they will maximize recovery of mined areas and the return of mined streams to productive fisheries habitat within a more reasonable time frame.

Water quality control measures must be designed to fully comply with all state and federal water quality standards and permit limitations. The Bureau of Land Management (BLM) must also deligently protect the values of the two National Wild Rivers by not allowing any degradation of water quality. Depending on the number of mines operating in eachdrainage and the amount of sediment likely to be discharged, this may require implementation of "zero discharge" water quality treatment systems.

The final action must include adequate measures to protect the special resource values of the Steese/White Mountains as covered above, or adopt the "no mining" alternative. It is so important.

Thank you for the comment opportunity.

Sincerely,

Mrs. Frank Hutton

2137 Seventh Avenue
Sacramento, California, 95818

17-1 See Section 1.6 for a discussion of BLM management mandates.

ARCTIC AUDUBON SOCIETY

P.O. BOX 82098
COLLEGE, ALASKA 99708

10 June 1988

BLM
701 C Street, Box 13
Anchorage, AK 99513

Comments RE: BEAVER CREEK/BIRCH CREEK EISs

18-1

BLM's preferred management alternative for these two areas does not adequately meet its managment responsibilities for wild & scenic rivers within national conservation and recreation areas. Only ALTERNATIVE C requires the water quality and reclamation standards necessary to safeguard these two streams and their watersheds from the cumulative effects of multiple mining operations.

Under the terms of ANILCA, mining within the Steese and White Mountain units must be managed so as to comply with the purposes for which these units were established. Thus, mining must

> promote, or [be] compatible with, or [not] significantly impair public recreation and conservation of the scenic, historic, fish and wildlife, or other values contributing to public enjoyment.

Clear, safe water, stable soils, and natural vegetation--all of which promote the health of fish and wildlife populations--are chief among those values contributing to public enjoyment, as well as fundamental ecological imperatives.

By selecting the least stringent management alternative as its Proposed Action, BLM has failed to fulfill its mandate.

Water Quality

The Proposed Action fails to address or adequately protect against cumulative impacts from multiple mining operations. Clearly, if each of sixty-odd mines (the Birch Creek figure) discharges water at a turbidity of 5 NTU (or more, if variances are granted), concentrations of suspended solids would become progressively greater downstream and, inevitably, would soon exceed the minimal increase-above-background intended by the mining regulations. Water quality would decrease; both fish spawning and downstream uses would be affected.

The only feasible way to ensure that multiple mining operations do not cumulatively degrade water quality is to require zero discharge/total recycle (ALT. C). The advantages of minimizing sediment (and chemical) discharges include significantly faster return of productive fisheries and less blockage of the streambed to infiltration. Therefore, we endorse the discharge standards of ALTERNATIVE C.

BLM's Proposed Action would allow the stream by-pass channel to remain. This would not provide flow characteristics or habitats conducive to fish passage and an eventual healthy fish population. Reclamation requirements must, therefore, include restoration of the original stream channel (or its equivalent). 18-2

Land Reclamation

The differences between reclamation methods mandated in the Proposed Action and ALT. C are major: If overburden and topsoil are not respread, re-vegetation (to a tall-shrub community) is estimated to take 50 years as opposed to perhaps 30 if fines are re-established over tailings. Both aesthetic and technical considerations dictate full reclamation practices as required in ALT. C. The Proposed Action sanctions undue and unnecessary continued erosional damage to disturbed sites. Erosion also adds to the continued sediment load of the stream and significantly delays its recovery to pre-mining conditions. Anything less than the fullest possible mitigation and restoration is unacceptable. Only ALT. C meets those requirements. (Re-seeding may not be the best means of encouraging re-vegetation, however, but that is a question for plant ecologists.)

Summary

BLM's Proposed Action for management of Beaver and Birch Creeks clearly fails to meet the ANILCA mandates for protection of resources within the Steese National Conservation Area and the White Mountains National Recreation Area. Consequences of implementing this alternative would be a decrease in water quality and unacceptable streamside erosion, with concommitant consequences for fish productivity, recreation, and downstream subsistence use.

Continued mining--as opposed to the "No Mining" alternative--is contingent upon management guidelines consistent both with state and federal water quality standards and with sound land reclamation practices. Management at any lesser level will undoubtedly result in further court challenges by the environmental community.

Sincerely,

June Weinstock

June Weinstock
Conservation Chairperson

18 Continued

18-1 ANILCA Section 1312 must be considered with ANILCA Section 403:

"Subject to valid existing rights, the Secretary shall administer the area in accordance with the provisions of Section 1312, other applicable provisions of this Act, the Federal Land Policy and Management Act of 1976, and other applicable law."

Mining claimants possess a valid existing right, for claims on which a valuable mineral deposit was discovered before the passage of ANILCA. Therefore, mining on valid claims with the White Mountains NRA is exempted from the criteria enumerated at Section 1312.

BLM has the authority and responsibility, as set forth in Section 302(b) of FLPMA and further defined in 43 CFR 3809, to manage the public lands so as to prevent "unnecessary or undue" degradation to the environment. This is the standard by which BLM manages mining activity in the White Mountains NRA. BLM ensures that mining does not significantly impair the values for which the NRA was established, while not interfering with legitimate mining operations.

18-2 See text additions.

16 JUNE 1988

MICHAEL J. PENFOLD
ATTN: RICHARD DWORSKY, PROJECT MANAGER
BUREAU OF LAND MANAGEMENT
ALASKA STATE OFFICE
701 C ST
BOX 13
ANCHORAGE, AK 99513

DEAR SIR

REFERENCE: DRAFT CUMULATOVE ENVIRONMENTAL IMPACT STATEMENT FOR BEAVER CREEK PLACER MINING

I BELIEVE THAT ALTERNATIVE "D" SHOULD BE THE PREFERED ALTERNATIVE.

ALTERNATIVE "D" WOULD PROTECT BEAVER CREEK NATIONAL WILD RIVER FROM SILT BUILD UP AND KEEP THE WATER QUALITY IN EXCELLENT SHAPE. IT WOULD ALSO PROTECT FISH RUNS IN THE AREA.

SINCERELY

Harry E Wilson

HARRY E. WILSON
2120 N CALLOW AVE
BREMERTON, WA 98312-2908

Northern Alaska Environmental Center
218 DRIVEWAY
FAIRBANKS, ALASKA 99701
(907) 452-5021

June 17, 1988

Richard Dworsky
Bureau of Land Management
701 "C" Street, Box 13
Anchorge, Alaska 99513

Dear Mr. Dworsky:

The following are the comments of the Northern Alaska Environmental Center (NAEC) on the Draft Cumulative Environmental Impact Statement (DEIS) for the Beaver Creek drainage within the White Mountains National Recreation Area (WMNRA).

20-1 The NAEC strongly objects to the BLM's Proposed Action because it fails to provide for a placer mining management program which will protect the renewable resources of the WMNRA in a manner consistent with the Alaska National Interest Lands Conservation Act (ANILCA) and other applicable federal and state laws and regulations.

20-2 Simply put, a Proposed Action which results in "Long-term impacts to the recreation resource..." (DEIS page 4-55) is not a legally viable alternative in the WMNRA. This position is based on the management mandate for the WMNRA which is defined in Section 1312 (a) of ANILCA. The requirements of Section 1312, which are not even printed in the DEIS, state:

> "The White Mountains National Recreation Area...shall be administered by the Secretary in order to provide for public outdoor recreation use and enjoyment and for the conservation of scenic, scientific, historic, fish and wildlife, and other values contributing to public enjoyment of such area. Except as otherwise provided by this Act, the Secretary shall administer the recreation area in a manner which in his judgement will best provide for (1) public outdoor recreation benefits; (2) conservation of scenic, scientific, historic, fish and wildlife, and other values contributing to public enjoyment; and, (3) such management, utilization, and disposal of natural resources and the continuation of such existing uses and developments as will promote, or are compatible with, or do not significantly impair public recreation and the conservation of of the scenic, scientific, fish and wildlife or other values contributing to public enjoyment." (emphasis added).

20-3 The current Proposed Action does not provide the level of resource protection needed to fulfill the goals and objectives of the WMNRA Resource Management Plan (RMP) or the Beaver Creek River Management Plan. Page 5 of the RMP states: "Important recreational resource values that make the WMNRA

unique will be enhanced and protected. These values include the outstanding scenic qualities of the viewshed, the natural state of the river corridor, the water quality of the river system, the fishing and hunting opportunities, wildlife viewing..." (emphasis added). The RMP goes on to state that "the primary emphasis of the wildlife habitat management program will be habitat protection, maintenance, and improvement" (RMP page 7); and, "Fish habitat will be managed to maintain and/or enhance fish populations for the use and enjoyment of recreational users of the WMNRA. Primary emphasis will be placed on habitat for arctic grayling. Management actions will include development projects to rehabilitate stream stream and riparian areas such as Nome Creek where past placer mining activity has altered the aquatic environment" (RMP page 9).

Despite these management policies defined in the RMP, the DEIS indicates that under the Proposed Action, "long-term impacts on the recreation resource will continue under this alternative until vegetative cover and water quality are returned to the natural conditions that existed before mining occured. Wildlife viewing is an important recreation activity dependent upon wildlife in the area. Long-term impacts to the wildlife habitat will also impact hunting, fishing, and wildlife viewing activities accordingly" (DEIS page 4-55). The DEIS also states that under the Proposed Action "stream segments directly affected by mining operations are not expected to support arctic grayling or other species"; and the "combined effect of the mining operation will at least partially eliminate grayling from mined reaches of the stream" (DEIS page 4-22). With regard to wildlife the DEIS states that the "long-term cumulative loss of habitat to mining acticvities in these areas of Beaver Creek and adjacent State lands would probably contribute to a low-level in moose population" (DEIS page 4-27).

While it is quite disturbing to see that BLM has selected a Proposed Action which violates the policies of the RMP, it is even more troubling in the context of recent management actions in the White Mountains. In April, 1986 the Bureau completed a Recreation Activity Management Plan (RAMP) for the WMNRA which places major emphasis on increasing recreation opportunities in the Nome Creek drainage. Under this plan the BLM will spend several million dollars in the next several years to develop a road and campground into the Nome Creek drainage. A major aspect of this project includes rehabilitation of the Nome Creek stream channel to replace fish habitat destroyed by past mining activity. While BLM is in the process of making a major expenditure of public funds for this purpose, the same agency does not propose to require existing mining operations to rehabilitate fish habitat as is required under the 3809 Regulations. In addition, the BLM has recently spent a considerable sum of money to undertake a controlled burn in the headwaters of Beaver Creek for the purpose of enhancing moose winter range habitat while at the same time the Proposed Action in the DEIS does not require strict measures to swiftly and fully reclaim the same habitat type. If the BLM is serious about "protecting and enhancing" fish and wildlife habitat then it must be done in a consistent manner and applied to all agency or non-agency actions. 20-4

A third major area where BLM has apparently forgotten its own actions in preparation of the DEIS involves the consideration of hard rock mining in the analyis of cumulative impacts which are quite possible under a scenario 20-5

20-5 cont'd involving an increase in mining in the drainage. With the recent completion of mineral inventories in the White Mountains and all the accompanying hype concerning the potential for "world class" hard rock mineral deposits there is little mention of these events or their possible impacts in the DEIS.

20-6 When BLM has just released a mineral assessment report which indicates the possibility of major deposits of uranium and other heavy metals it is very difficult to believe the DEIS's assertion that "the nature of the basin, its geology, and the relative size of the affected drainages are such that one would not expect a significant/change/in the chemical components such as heavy metals or ions..." This is especially difficult to swallow when BLM has sumarily dismissed all consideration of chemical impacts to water quality in the DEIS based on this "logic." The final EIS must address chemical impacts to water quality.

The NAEC has endorsed a swift schedule for completion of the various mining EISs in order to prevent any unnecessary halt to mining activity in the affected drainages. However, at this time, we must express our extreme disappointment that the BLM has expedited the process to the extent that legal requirements for management of mining have taken a back seat to BLM's usual posture of facilitating mining regardless of the impacts likely to occur to other resource values. It is apparent that during preparation of the EIS, field research and compilation and analysis of scientific data have taken a secondary role to the practice of making assumptions which are designed to ensure a predetermined, politically motivated outcome. We should not have to remind the Bureau that this posture is what resulted in the current court control of mining. If the BLM selects a final action which does not meet legal requirements the agency will not be helping the mining community or any other segment of the concerned public.

It is apparent that BLM has selected its Proposed Action based on a formula which will please miners and some politicians and which the agency presumably hopes will meet the minimum legal requirements. It is unfortunate that the EIS was not prepared with the objective of defining a placer mining management program which could best protect the environment while mining occurs. If this had been the objective Alternative C would have to be the Bureau's Proposed Action.

The NAEC urges the BLM to adopt Alternative C in its final decision in this EIS process. Alternative C can best meet BLM's legal requirements and can best comply with the management goals and policies outlined in the WMNRA Resource Management Plan and the Beaver Creek Wild River Management Plan. This alternative can also best meet BLM's mandatory obligation to ensure compliance with Environmental Protection Agency (EPA) and Army Corps of Engineers regulations. Compliance with the provisions of the RMP and other state and federal agency regulations is a mandatory obligation of the BLM which cannot be considered optional in any legally viable alternatives as is the case in the Proposed Action and Alternatives A and B.

We strongly object to the manner in which the EIS downplays the benefits which can be derived by the better reclamation and water quality protection measures outlined in Alternative C as compared to the Proposed Action. Many of the final conclusions regarding the environmental consequances of the

20 Continued

various alternatives are directly contradicted by data within the EIS.

As an example, the Affected Environment section of the EIS includes information taken from the Alaska Department of Fish and Game (ADF&G) and other sources which indicates that recovery of mined areas will occur at a much faster rate if the fine materials in the overburden, which is stripped before reaching pay gravels and collected in settling ponds, is respread over the tailings after mining is completed. The EIS states, "Succession in placer mine tails depends very heavily on the percentage of fine-grained materials or "fines" in the substrate." Under the Proposed Action BLM will not require the fines from settling ponds, the main source of such fine materials in areas such as Nome Creek which have previously been stripped of overburden, to be respread over tailings in the reclamation process. In evaluating the Proposed Action's environmental consequences with regard to soil structure, the EIS states "Locations devoid of fine material would develop soil structure extremely slowly, if at all, with little or no vegetation being established." The environmental consequences analysis of Alternative C which requires respreading of fine materials from ponds over tailings states "This alternative would essentially provide for restoration of the disturbed area...revegetation would probably speed up the process of surface stabilization and reduce the rate of erosion from the disturbed area." In examining the irreversible and irretrievable committment of soil resources which would occur under the various alternatives, BLM summarily dismisses the benefits to be gained through sound reclamation practices by stating, "There would be no significant irreversible and irretrievable committment of soil resources under the Proposed Action and Alternatives A,B, and C since productive soil stability will eventually develop after 50 years if reclamation practices are followed." This analysis fails to recognize that even under BLM's estimates the time frame involved in site recovery is twice as long for the Proposed Action (50 years) as compared to Alternative C (25-30 years). **20-7** In addition, BLM's prediction that a site will recover in 50 years without respreading of fines is not scientifically substantiated. There are many sites in interior Alaska which were mined over 50 years ago and show almost no soil and vegetation recovery at the present time. This type of faulty, unsubstantiated analysis is found throughout the EIS and severely undercuts the credibility of the entire document. **20-8**

A second example which demonstrates how the DEIS was compiled in a manner intended to justify existing mining practices rather than devise an environmentally sound management program is the treatment of sediment loading in the Beaver Creek system. Nowhere in the EIS does the BLM attempt to calculate how much sediment the Beaver Creek system is capable of transporting without unnecessary and undue degradation to the aquatic system and other resources. **20-9** If this approach were taken the BLM could then determine the amount of sediment each mine could discharge into the system without causing adverse effects based on the number of mines proposing to operate in any given year. The number of mines intending to operate could be divided by the environmentally sound sediment transport capacity to determine each mine's allowable sediment discharge rates with the maximum discharge being that allowed under EPA and ADEC water quality regulations and permits. This approach would also allow the BLM to set treatment standards for sediment effluent based on what the system can handle rather **20-10**

20 Continued

than a blanket across the board treatment as is proposed in the various alternatives included in the DEIS. With few mines operating the BLM could allow issuance of EPA variances with increased turbidity effluent limitations without adversely affecting the aquatic system (as in the Proposed Action). On the other hand, if for various reasons such as a major increase in the price of gold, many mines proposed to operate in the drainage, the increase in sediment discharge allowed under an EPA variance may reach the point where the aquatic system would be adveresly affected by the cumulative effects of sediment effluent from all the mines and a different standard of no EPA variances (as in Alternative B) or zero effluent discharge (as in Alternative C) would then be needed in order to protect the Beaver Creek system from excessive sedimentation.

20-10 cont'd

Instead, the approach taken in the EIS is to argue that sediment introduced into the aquatic system from placer mines is insignificant compared to that resulting from natural runoff and, therefore, it makes little difference how tightly sediment discharges from mines are controlled. In developing this argument BLM presents data in Figures 3-2 and 4-1 taken from an EPA publication giving estimates for the tonnage rate of sediment per square mile for forested lands. It is unclear why BLM has chosen to use data derived by EPA in 1973 from studies conducted in the lower 48 states rather than utilize the data available from recent studies on Alaska cold water streams (see studies conducted by Steve Mack for the Alaska Division of Geological and Geophysical Surveys 1986 and 1987). We can only speculate that this decision was made because the EPA data indicate natural sediment loads which are orders of magnitude higher than recent studies conducted in Alaska, thereby trivializing the amount of sediment introduced into the system by placer mining. To be quite blunt, it appears that the EPA data could be used to support BLM's predetermined position that mining must once again move forward as quickly with as little regulation as possible where recent data complied in Alaska by DGGS, Dames and Moore, and ADF&G indicates that natural sediment loads in interior Alaska streams are quite low and that large quantities of sediment from mines may greatly change the physical and biological characteristics of the stream.

To be more specific, calculations prepared by the ADF&G based on actual data for total suspended sediments and stream discharge indicate that the annual sediment loading for unmined streams is 5.8 tons per year. This figure is approxiately 6000 times less than the 40,392 tons per year figure given by BLM in figures 3-2 and 4-1 of the EIS. We strongly urge the Bureau to consult with the ADF&G and DGGS to present accurate sediment load figures in the final EIS. Estimations of the environmental consequences of each of the alternatives will also have to be adjusted accordingly in the final document. Once this is accomplished, the benefits of tighter controls on sediment discharges will become apparent.

The Beaver Creek DEIS is extremely deficient in its explanation of water quality standards and regulations and the responsibilities of the EPA and the Alaska Department of Environmental Conservation (ADEC) with regard to
20-11 water quality protection. The DEIS does not explain the difference between end-of-pipe effluent limitations and state in-stream standards or how and when a 500 foot mixing zone can be applied. A major factor shaping the alternatives in the DEIS is whether an EPA variance will be allowed or not.

The economic analysis of the alternatives as shown in Figure 2-6 shows major differences in the cost of operating a mine depending on whether EPA variances are allowed. Despite all the importance placed on this magical concept of an EPA variance in the DEIS, nowhere in the document can the 20-12
reader find an explanation of what an EPA variance is or how the application of such variances will greatly reduce the cost of water quality treatment. We believe that in the case of the small creeks at the headwaters of Beaver Creek where most placer mining occurs there is insufficient water flows to make the use of EPA variances result in any substantial difference in the cost of complying with water quality standards. It is also interesting to note that the economic analyis in the DEIS indicates that the costs of reclamation differ very little between the various alternatives, especially in comparison to water treatment costs. For these reasons, the number of 20-13
mines likely to operate in the drainage under Alternative C should not be greatly different than the number of mines predicted to operate under the Proposed Action.

The BLM has two major responsibilities with regard to water quality, both of which must be met. The first is to ensure compliance with all state and federal water quality permits and regulations. The second is to ensure that 20-14
the waters of Beaver Creek National Wild River are not degraded. In order to fulfill these two mandates different treatment standards may need to be applied depending on the number of mines proposing to operate in the drainage in a given year. With few mines operating the higher level of sediment discharge allowed with the use of EPA variances may not adveresly affect the aquatic system. With a greater number of mines operating it may be necessary to restrict sediment discharge to the standard EPA effluent limitation of 5 NTU. With a large number of mines in operation the 5 NTU increase above background allowed each mine could result in cumulative adverse effects to the aquatic system. If, for example, there were 30 mines in operation, the turbidity of Beaver Creek could reach 150 NTU, a point where the aquatic system would obviously be adversely affected. In this situation it would be necessary for the BLM to require zero effluent 20-15
discharge in order to prevent degradation of the water of Beaver Creek. If the final EIS does not incorporate a determination of sediment transport capabilities of the Beaver Creek system then the BLM must adopt the zero effluent discharge policy included in Alternative C to ensure that degradation of water quality does not take place.

We strongly oppose the policy of the Proposed Action to allow a stream bypass to become the permanent stream channel. The fish habitat reclamation practices outlined in Alternative C are necessary in order to comply with the BLM's own 3809 regulations and ADF&G fisheries protection regulations. This is especially important because sport fishing is a major recreational activity in the Nome Creek area and the entire Beaver Creek system. The DEIS includes ample documentation of the need for, and benefits of, fish habitat reclamation.

<u>SPECIFIC COMMENTS BY PAGE</u>

page 1-5: Significant issues evaluated should include "How can the adverse impacts caused by placer mining be minimized under existing laws?" 20-16

20 Continued

20-17 2-2: BLM's definition of "undue and unnecessary" as "customary and prudent placer mining operations" is unacceptable. "Customary" placer mining operations in Alaska have not operated within the law and should therefore not be used as a defining standard.

20-18 2-6: While the Proposed Action is to implement the mining standards required in 1987 the DEIS does not explain precisely what those standards are. It is not clear whether the mine operating in 1987 even complied with state and federal water quality regulations. The final EIS should clarify exactly what took place in 1987 and precisely what the Proposed Action entails.

20-19 2-12: The final EIS should explain the legal rational for why miners are to be compensated for the value of mining claims if Alternative D is selected. It is not clear why the BLM would have any obligation to compensate miners for the value of claims.

20-20 None of the alternatives give any explanation of what kind of enforcement measures will be used to ensure compliance with regulations. Many good policies are included in the WMNRA RMP, yet it is obvious that their being printed in the document did not result in the policies being followed. Enforcement measuremust must be defined if the public is to have any confidence in their implementation.

20-21 2-17: At the bottom of this page and in other locations the statement is made that "the impact on chemical water quality is not expected to be significant." This statement is not verified scientifically and chemical water quality impacts are not addressed in the DEIS. The final document should assess chemical water quality impacts in detail.

20-22 2-18: The DEIS continually states that "Recreational activities would be enhanced due to increased access provided by additional mining roads...". This blanket assertion fails to recognize the importance of non-motorized recreation in the WMNRA. Page 16 of the WMNRA RAMP states "...this lack of improved access is probably the single most important reason that the outstanding primitive opportunities remain prevalent today in an area so near Fairbanks." The final EIS should recognize and evaluate the importance of primitive, non-roaded recreation opportunities in the same context as the asserted benefits of roaded recreation opportunities. At the very least, the benefits or impacts of additional roads should be considered in the context of the land use designations established in the WMNRA RMP.

20-23 2-24: Figure 2-6 indicates that landcover would return to a shrub community in 25-30 years under Alternative C as compared to 50 years under the Proposed Action yet this difference in recovery rates is not considered significant in the analysis of the environmental consequences. A 25 year difference in recovery rates is very substantial and should be treated as significant.

20-24 3-1: According to the text wilderness resources do not exist within the White Mountains. The only place where wilderness resources and values do not exist is in the minds of Department of Interior officials who refuse to

acknowledge the outstanding wilderness values of the White Mountains because of James Watt's "no more wilderness" policy. To be accurate, the final EIS should point out that outstanding wilderness values undoubtedly exist in the White Mountains but that current BLM policy prohibits their consideration. **20-24 cont'd**

3-15: According to the description of the mine operating in 1987, Nome Creek's turbidity level was sufficiently diluted to "nearly undectable levels by the time it reached Beaver Creek." This statement indicates that the 1987 mine was not in compliance with State Water Quality Standards (a twenty mile mixing zone is not allowed). If this is what is intended by the Proposed Action it will definately not meet legal requirements.

3-47: The "resident family" at the confluence of Victoria Creek and Beaver Creek are not "otherwise engaged in mining." The Miller's have never been involved in mining in that area and are primarily trappers and subsistence users. **20-25**

3-51: A float all the way down Beaver Creek to the Yukon Bridge is not an 8-10 day float. Two weeks should be considered the minimum time necessary for the average floater to complete this trip. **20-26**

4-24: The entire discussion of the environmental consequences of the alternatives fails to address the critical importance of riparian habitat to a variety of wildlife species. Riparian habitat should be recognized as critical wildlife habitat in the final EIS and the environmental consequences of the alternatives should be rewritten in light of the various alternative's ability to restore this critical habitat. **20-27**

In summary, we would like to urge the BLM to select Alternative C as the final Proposed Action so that environmentally sound mining can continue and the resources of the White Mountains National Recreation Area can be given the protection they so well deserve.

Sincerely,

Randy R. Rogers

Randy R. Rogers

cc: Don Runberg, District Manager

20 Continued

20-1 See Section 1.6.

20-2 See response 18-1, which discusses how the requirements of ANILCA Section 1312 are modified by ANILCA Section 403. The identified long-term negative impacts to the recreation resource are a direct result of the exercise of valid existing rights.

20-3 See additions to Section 1.6 and response 18-1.

20-4 The Resource Management Plan (RMP) for the White Mountains NRA (DOI 1986a) outlines a management prescription to restore fish habitat on Nome Creek (p. 23). While the RMP speculated about what such a project might entail, actual decisions about the methodology and extent of the project were deferred, pending development of a specific project plan for Nome Creek fish habitat restoration. The project plan has not yet been developed.

Since the 43 CFR 3809 regulations were promulgated in 1981, BLM has required mining reclamation, including reclamation of fish habitat, and will continue to do so. Under all alternatives, mining operators must continue to provide for fish passage, must meet water quality performance standards and must reclaim sites to minimize subsequent introduction of sediment into the creek by erosion at the mining site.

See the Summary and Section 1.6, for further discussion about how individual, site-specific EAs will be tiered from this EIS, and the interrelationships of the 1986 RMP, 1988 RAMP, and this EIS.

20-5 This EIS focuses on placer mining at the direction of the court.

20-6 See text revision, Sections 4.4 and 4.7. Information presented by the USF&WS (DOI 1988) for Beaver Creek indicates elevated concentrations of selenium in kidney tissue samples from grayling taken from Beaver Creek. Although this raises a question, there is no way to link this to elevated levels of selenium in the Beaver Creek water column, given the transient nature of grayling, minimal mining activity in the basin, and information presented by Mack and Moorman (1986) and the EPA.

20-7 This section of the EIS has been revised.

20-8 Most mine tailings that remain barren after more than 50 years are those which have been left as steep-sided piles with little to no fine-grained materials near the surface.

20-9 See Section 2.4, for the addition of a range of alternatives which considered thresholds, but were not analyzed in this EIS.

20-10 This idea was reviewed as a possible option for analysis when we began the EIS process. It is true that the National Park Service has formulated a "threshold" analysis for its Yukon- Charley EIS; however, the BLM cannot use this method because of two critical reasons.

1) The BLM and the NPS have substantially different enabling acts under which we administer placer mining; that is, we cannot disallow an application to mine, as can the Park Service if we were to determine that its operation would add to the cumulative adverse impact of mining in a river system; 2) We believe that our worst-case analysis supplants the need to expend exorbitant amounts of time and energy gathering a massive database which could possibly identify the total sediment load of the Beaver Creek drainage. Furthermore, we believe that these data would not bring us any closer to solving the sediment problems in the watershed as just sound management could under the 43 CFR 3809 regulations identified in the Proposed Action.

20-11 The regulatory roles and the water quality standards of the EPA and the ADEC have been further defined in the FEIS. An explanation of an EPA variance has been included in Chapter Two. It is not the BLM's nor this EIS's role to decide whether a variance will be allowed for a mining operation; however, Alternatives A, B, and C did analyze the environmental impacts of no EPA variances.

20-12 An EPA variance, as considered in the water quality performance standards of the Proposed Action, would allow a mine operator with a valid National Pollution Discharge Elimination System (NPDES) permit to discharge effluent with a measured turbidity grater than the State standard of 5 NTU above natural background. To obtain this variance, the miner would submit site-specific information to EPA for evaluation of the dilution capability of the receiving stream. This information would include low, medium, and high stream volumes and velocities, size of the stream drainage, annual rainfall, stream water quality, and expected effluent discharge volume. the variance in the turbidity limit of the effluent is then based on careful analysis of these factors.

20-13 The difference in number of mines under the various alternatives is largely a function of the cost of complying with water quality standards.

20-14 The BLM does not administer nor ensure compliance of all federal and State water quality regulations and permits. The ADEC and EPA have primary responsibility for assuring compliance with these requirements. See Section 1.7 for further discussion on the role of these agencies. However, under BLM's regulations any operation which violates its permit or water quality limitations is in noncompliance and is required to cease operation until it can again operate in compliance with all applicable permits.

See Section 2.4 for discussion about a system based on advance predictions of the number of mines per year.

20-15 Thirty mines that discharge within the 5 NTU effluent limit as described in the EIS would not produce a turbidity level increase of 150 NTU as suggested. The 5 NTU allowable increase in turbidity is measured against the natural condition of the receiving stream and would not cause a 5 NTU increase at each mine, providing water quality standards are met. This standard for turbidity is found at 18 Alaska Administrative Cod 70.020 and is discussed further in Section 2.3.2.

20-16 The Proposed Action and Alternatives A, B, and C are all within existing law.

20-17 The text has been changed to rephrase the definition of "undue or unnecessary."

20-18 The performance standards and the probable actions associated with mining under the Proposed Action are stated in Section 2.3.2. The mine that operated on Nome Creek was not cited for any water quality violations. Section 3.2.2 outlines the mining activity that occurred at that location.

20-19 The federal courts have been very clear on this subject. That is, if there is a discovery of a valuable mineral deposit upon a properly located claim, the possessory right of the locator is a property right in the full sense, unaffected by the fact that paramount title to the land still rests with the United States. Therefore, a mining claim is a property right in the highest sense and is within the protection of the Fifth Amendment's prohibition against the taking of private property for public use without just compensation.

20-20 Section 2.3.1, "Actions Common to All Alternatives," discusses enforcement measures under the subheading "Inspections and Bonding." Appendix B-3 provides additional information. BLM enforcement options are further set forth in 43 CFR 3809.3-2.

20-21 See Section 4.4.

20-22 The EIS has been revised to describe the beneficial and adverse impacts to recreation of additional roads and trails in the context of the existing management units (see Sections 3.10 and 4.10).

20-23 The 25 year difference between regrowth rates was not considered "substantial" when viewed in the context of reestablishment of the original riparian community, a process which may take as long as several hundred years. The data indicate a wide range for regrowth rates; Figure 2-6 represents an average $\pm$ 15 years.

20-24 There are no Congressionally-designated wilderness areas in the White Mountains NRA, and that is what the passage in question refers to.

20-25 The text has been revised accordingly.

20-26 This section has been revised.

20-27 Riparian zones are a special category for BLM management, and were discussed in Section 3.5. This section has been expanded to include the Bureau's definition of riparian zones. Most disturbed areas, especially in the Beaver Creek drainage, are considered to be in the riparian zone, and so analyses in Sections 4.5 and 4.6 refer mainly to riparian communities.

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 SIXTH AVENUE
SEATTLE, WASHINGTON 98101

JUN 17 1988

REPLY TO ATTN OF: WD-136

Richard Dworsky
Bureau of Land Management
701 C Street
Box 13
Anchorage, Alaska 99513

Re: Beaver Creek Placer Mining Draft Environmental Impact Statement

Dear Mr. Dworsky:

The Environmental Protection Agency (EPA) has reviewed the Beaver Creek Placer Mining Draft Environmental Impact Statement (DEIS). The Beaver Creek watershed is one of four watersheds in Alaska for which the Bureau of Land Management (BLM) is preparing environmental impact statements addressing the cumulative environmental impacts of placer mining. Our review has been conducted in accordance with the National Environmental Policy Act and EPA's specific responsibility under Section 309 of the Clean Air Act to determine whether the impacts are acceptable in terms of environmental quality, public health, and welfare.

Questions are raised in our detailed comments regarding the range of alternatives addressed, the significance of potential long-term and cumulative impacts, and the availability of mitigation measures. With the exception of Alternative D (a "no mining" alternative), the alternatives differ very little in regard to relative overall environmental consequences. Analysis of a broader range of alternative management approaches and mitigation options would have afforded a more distinct comparison of the corresponding relative impacts. The rationale for selection of the alternatives addressed in the DEIS should be clarified.

Also, EPA's recently promulgated effluent limitation guidelines and new source performance standards for placer mines (published in the Federal Register May 24, 1988) should be reflected in BLM's Proposed Action. Projects determined to be "new sources" under this rule will be subject to the provisions of the National Environmental Policy Act.

The DEIS should cite all potential impacts associated with placer mining. Because of the mobile, ongoing nature of placer mining, and attendant uncertainties regarding the future price of gold, cumulative impacts will occur in the watershed apart from any possible "short-term" effects associated with any one operation. The distinction between projected short-term, long-term, and cumulative impacts needs to be clear. Statements concluding that there will be "no significant effect" or "impact" should be avoided in the absence of a strong analytical basis.

The success of previously applied mitigation measures should be described in order to better judge the effectiveness of those mitigation measures and others listed in the DEIS. An evaluation of streambed restoration techniques and the effectiveness thereof should be included.

Significant impacts to water quality, fish and wildlife habitat, vegetation, and wetland functional values would occur under the Proposed Action given the limited mitigation incorporated into this alternative. Vegetation losses would be long-term in nature and in certain cases permanent, in turn affecting habitat values, water quality, and visual resources. Fish habitat would be directly eliminated, fish migration routes blocked, and fish habitat conditions degraded as a result of sedimentation and turbidity. Considerable winter moose habitat would be lost over the long-term. Wetland functional values would be lost, counter to the Clean Water Act 404(b)(1) Guidelines and EPA Region 10's 404 Mitigation Policy.

We have rated the Beaver Creek Placer Mining DEIS as EO-2 (Environmental Objections - Insufficient Information). Our rating reflects our concerns regarding the lack of mitigation incorporated into the Proposed Action and other alternatives. A summary of the EPA rating system for EIS's is enclosed for your reference. We believe that consideration of the general and specific comments (enclosed) is necessary to provide the basis for a complete assessment of available project alternatives.

Thank you for the opportunity to review the DEIS. We would be pleased to assist BLM in addressing our comments. Rick Seaborne in the Environmental Review Section is the lead contact person for this review and can be contacted at (206) 442-8510.

Sincerely,

Robert S. Burd

Robert S. Burd
Director, Water Division

Enclosures

cc: USFWS
ADFG
COE
ADEC

21 Continued

Environmental Protection Agency (EPA) Comments
Beaver Creek Placer Mining
Draft Cumulative Environmental Impact Statement

Page

1. 1-3 - para. 6: Clarify the reasoning for focusing the EIS analysis only on portions of the Beaver Creek watershed within the White Mountains National Recreation Area. 21-1

2. 2-1, 2-12, 2-13: Why are alternatives intended to address only performance standards and court orders, and no alternatives are addressed (besides the no-action alternative) outside the existing 43 CFR 3809 regulations? The basis for the selection of alternatives which are presented should be provided in the EIS. Is the "Proposed Action" the BLM's "Preferred Alternative"? The preferred alternative should be identified as such in the final EIS and justification provided for its selection. Also we suggest that an "environmentally preferred alternative" be identified in the final EIS. Why is an alternative not presented which incorporates withdrawal of all or a portion of the study area from mineral entry? 21-2 The alternatives can be comprised of mitigation component options which incorporate progressively more stringent mining operation controls and reclamation requirements. 21-3

3. 2-3: The practice of hydraulic removal of overburden, its relationship to BLM requirements, and corresponding impacts should be discussed. The DEIS should clearly state that discharges to waters of the U.S. from the hydraulic removal of overburden is a violation of the Clean Water Act unless specifically authorized under a federal NPDES permit. 21-4

4. 2-6: The rationale for selection of the Proposed Action (status quo) needs to be presented. Also, the Proposed Action needs to incorporate the recently promulgated EPA Effluent Limitation Guidelines and New Source Performance Standards for placer mines. These were published in the Federal Register May 24, 1988. The "current" EPA effluent guidelines (as referred to in the DEIS) are actually the previous guidelines. The new EPA standard is .2 ml/l settleable solids. The State standards include the 5 NTU standard as well as the 0.05 mg/l arsenic standard (not cited in the DEIS). The new EPA standard calls for recirculation of process wastewater. Resultant decreases in discharge effects need to be accounted for under this alternative. 21-5 Additionally, the DEIS should discuss BLM's intended enforcement programs to assure compliance with State standards and NPDES permit conditions and limitations. 21-6

5. 2-7, 2-9: It should be clarified that EPA NPDES permit conditions are assessed at the point of discharge, prior to entering the receiving stream. 21-7

6. 2-11 - para. 2: Discussion of potential 0 ml/l settleable solids, and 0 NTU standards under Alternative C is not relevant in light of the applicable standards recently promulgated. 21-8

21-9 7. 2-15 - para. 7: With 5 mines operating continuously during the study period, along with the potential for the re-mining of previously mined areas, the "return of water quality to approximately natural conditions after successful stabilization" may only be possible in the project-specific sense, and does not appear to account for ongoing cumulative effects.

21-10 8. 2-15 - last para.: Short-term vs. long-term impacts need to be defined. The DEIS refers (here and in the description of other alternatives) to an unavoidable "short-term loss of productivity" as a result of mining-induced loss of vegetation cover, however goes on to cite disturbed areas which will require up to 50 years to revegetate and areas which will remain permanently barren or sparsely vegetated. These would not be considered short-term effects. Short-term impacts do not apply to the ongoing future cumulative impacts from placer mining.

21-11 Do productivity loss assumptions account for ongoing potential future mining in previously reclaimed areas?

21-12 9. 2-16 - para. 2: Define "crucial wildlife habitats." Do these areas (referred to here and in description of other alternatives) exist in the study area, and could they be impacted?

21-13 10. 2-16 - para. 4: Paragraph (here and in description of other alternatives) only refers to effects of sediment on fish habitat. Other fish habitat impacts need to be cited as well. It is unlikely that these impacts can be characterized as short-term given the ongoing cumulative effects of placer mining in the watershed. Fisheries resource losses can be considered irretrievable unless fish habitat is successfully restored.

21-14 11. 2-16 - para. 7: Adverse impacts to recreational activities should be cited.

21-15 12. 2-16 - last para.: Sentence (hear and in description of other alternatives) should refer to impacts to visual resources as a result of actual mine operations and stripping.

21-16 13. 2-17 - last para.: Statement that "water quality would return to approximately natural conditions" does not appear to account for the ongoing and future cumulative effects of placer mining.

21-17 14. 2-22 - para. 4: Loss of vegetative cover as a result of previous mining is an impact applicable to all alternatives, however is only mentioned under Alternative D. The relative impacts of previously disturbed areas under all alternatives should be discussed. Also, do certain alternatives provide greater opportunity for reclamation of previously disturbed areas than others?

21-18 15. 4-4 - para. 4 & 7: Clarify similarities cited between the Proposed Action and Alternative D, which is a "no-mining" alternative.

21 Continued

16. 4-6: It is unclear how environmental consequences can be addressed in the context of mineral resources. Why are severe negative impacts cited (resulting from cessation of mining activities in the Beaver Creek study area under Alternative D) of region-wide significance? What are the indirect effects referred to? 21-19

17. 4-7, 4-8, 4-9: Potential erosion impacts resulting from roadbuilding and construction of ancillary facilities needs to be analyzed. 21-20

18. 4-9 - para. 2: Destruction of existing soil structure through mining does represent irreversible and irretrievable commitment of soil resources. Also, as a result of past and ongoing mining, certain soils will be rendered unproductive over the long-term (i.e. will remain barren or sparsely vegetated). 21-21

19. 4-10 - para. 1: Potential adverse impacts resulting from fuel and oil spills should be discussed. 21-22

20. 4-11: Because successful revegetation of all disturbed areas is not possible, the long-term impacts to water quality resulting from erosion from these areas should be addressed. 21-23

21. 4-12 - para. 1: Provide basis for the conclusion that the downstream effect from non-point sources under the Proposed Action would probably be indistinguishable from expected natural conditions (last sentence). 21-24

22. 4-12, 4-13, 4-14, 4-15: The DEIS indicates, within the discussions of the water quality impacts of each alternative, that the impacts on chemical water quality are unknown. Potential chemical water quality impacts are discussed in the Fisheries section (page 4-39) however. Additional discussion of potential chemical water quality impacts of placer mining needs to be provided in the Water Resources section. 21-25

23. 4-12 - para. 3: This paragraph (first sentence) indicates that the impact on chemical water quality is "unknown." The last sentence indicates that the impact on chemical water quality would not be expected to be "significant." These statements appear contradictory and need to be clarified in light of potential chemical water quality impacts.

24. 4-12 - para. 5: What potential water quality impacts can be expected to result from construction of roads and trails? 21-26

25. 4-13 - para. 5: Clarify how impacts to water quality (from Alternative B) would be the same as for Alternative A as indicated in the first sentence, given reduced erosion rates expected under Alternative B as a result of reclamation requirements. Wouldn't these reclamation practices result in an incremental improvement in water quality? 21-27

21 Continued

21-28 26. 4-14 - para. 4: What incremental improvement to water quality and channel morphology can be expected to occur as a result of implementation of Alternative C?

21-29 27. 4-27, 4-29, 4-30, 4-32: Define "crucial wildlife habitats" and clarify the potential for disruption of these habitats as a result of mining activities.

21-30 28. 4-56 - para. 5: The DEIS should clarify to what degree the possible recreation benefits resulting from increased access may be counteracted by possible decreases in fishing and hunting and decreases in the quality of the wilderness experience.

21-31 29. 4-59, 4-60, 4-61: The economics section discusses employment and income generated by placer mining in four watersheds. Because the scope and impact analysis of this EIS has been limited to the Beaver Creek study area, the analysis of the economic impacts of placer mining should be limited to the same study area.

21-32 Also, the analysis is incomplete without a balancing of the economic benefits (given) with the economic costs of placer mining (e.g., costs of regulation, enforcement, management, potential reduced recreation expenditures, etc.).

21-33 30. 4-62: The DEIS does not clarify what specific mitigation measures are incorporated into BLM plan of operation approvals. What is the administrative process for reviewing plans of operations and what mitigation requirements can be incorporated through this review process?

21-34 Discussion of the relative success of mitigation measures should be provided with emphasis on streambed restoration. Also, the EIS should discuss BLM's ability to implement a bonding program and why or why not they may choose to do so.

21-35 31. 4-64: The difference between the "X" and "some" designations should be clarified in Figure 4-8.

The resource impacts cited in Figure 4-8 should be reviewed to insure that all potential irreversible and irretrievable commitments of resources are indicated. It appears that irreversible and irretrievable commitments of resources could occur in relation to several impacts where it is not so indicated in Figure 4-8. These impacts include: loss of fine-grained soil through erosion, accelerated erosion from non-point sources, greater stream channel gradient and reduced sinuosity, loss of fine-grained material in soils, loss of fish habitat, decreased primitive experience.

Mitigation measures are presented in Figure 4-8 which go beyond those incorporated into the Proposed Action. Therefore, unavoidable adverse impacts may occur under the Proposed Action which would not occur under Alternatives C or D. The figure does not afford a comparison of the relative impacts, mitigation options, and irreversible and irretrievable

21 Continued

commitments of resources specific to each alternative, including the Proposed Action. To assist in this analysis, the figure should identify which alternative applies to which mitigation measure under the column entitled "mitigation under the alternatives", and which alternative applies to "irreversible and irretrievable commitments of resources" designations under the last column.

Additional Comments

Wetland impacts within the watershed should be addressed in the DEIS vis-a-vis available Corps of Engineers permitting options and the Clean Water Act 404(b)(1) Guidelines. 21-36

In order to comply with the 404(b)(1) Guidelines, measures to avoid wetlands, minimize wetland impacts, or provide in-kind replacement of aquatic site functional values must be incorporated into 404 permitting decisions. 21-37
The cumulative impacts of placer mines on wetland functional values should be evaluated. 21-38

21-1 The area covered by this EIS is the area specified by Court Order.

21-2 BLM regulates surface management activities under 43 CFR 3809, and the Alaska surface management handbook and these activities are discretionary actions of the authorizing officer - in this case the District Manager. The discretionary actions are subject to the standards established in the WMRMP.

Additionally, the BLM has already considered a broader range of alternatives in the WMRMP and this evaluation estimates the cumulative environmental impacts within this management framework. The EIS team also considered a broader range of alternatives (Section 2.4), but eliminated them from further analysis for a variety of reasons.

Environmental evaluations for managing the 43 CFR 3809 program was accomplished in 1980 by the Washington Office of the BLM and present statewide and area specific standards are tiered off this document.

21-3 The alternatives do represent a range of progressively more stringent requirements.

21-4 Hydraulic removal of overburden is not an issue in the Beaver Creek drainage.

21-5 The EPA effluent guidelines changed after the release of the DEIS to the public. The alternative analyzed in the DEIS incorporated standards above and below EPA's current guidelines.

21-6 The BLM does not administer nor ensure compliance of all federal and State water quality regulations and permits. The ADEC and EPA have primary responsibility for assuring compliance with these requirements. See Section 1.7 for further discussion on the role of these agencies.

21-7 The NPDES permit conditions have been clarified in Section 2.3.2.

21-8 The water quality performance standards for Alternative C, zero ml/l settleable solids and turbidity of zero NTU above natural conditions, were chosen because these standards represented the maximum restrictions possible for the discharge of mine effluent. The BLM fully realized that these standards were just one set of several that were being considered by EPA for final effluent guidelines; nevertheless, BLM chose to evaluate the maximum level of water quality standards. EPA's selection of standards different than those analyzed in Alternative C will not impact BLM's selection of a Proposed Action, since BLM does not regulate effluent guidelines or water quality standards.

21-9 See Section 4.4 for additional information.

21-10 See Section 3.5.3. "Cumulative" impacts are defined in the glossary, quoted from the CEQ regulations.

The time frames for short- and long-term effects vary by resource being evaluated. Short-term impacts to water quality generally last one season during mining, while short-term impacts to vegetation productivity last up to five years after disturbance. Long-term impacts to water quality may begin after mining and continue for 10 or 20 years, while long-term impacts to vegetation are greater than 50 years. Cumulative impacts are defined in the glossary, and quoted from the CEQ regulations at 40 CFR 1508.7 in Section 1.3.

21-11 Yes.

21-12 The definition for crucial wildlife habitat has been added to the glossary. Discussion concerning the presence and potential effects of mining to these areas may be found in Sections 3.6 and 4.6.

21-13 Section 2.5 is merely a summary of environmental consequences. Please refer to Section 4.7 for a more complete discussion of the effects of the alternatives on fisheries.

21-14 Section 2.5 has been revised to cite both beneficial and adverse impacts to recreation.

21-15 Text has been revised accordingly.

21-16 See Section 4.4 for additional information.

21-17 First comment: These data are in the files in the original spreadsheet that was generated to model the impacts of the alternatives.

Second comment: Yes. Realistically the alternatives with mining provide better opportunity for reclamation of post 1980 disturbance than does Alternative D. This is because under the mining alternatives, some of that disturbance will be remined and reclaimed under that Plan of Operations, and equipment would be available in the area to reclaim other disturbance. BLM may require reclamation of past disturbance by a claimant as a condition for authorizing additional work.

As an example, in 1984 an operator on Nome Creek reclaimed 40 acres of old tailings by leveling and recontouring the area using equipment which had been brought in for mining. Some of the 40 acres were pre-1981 disturbance, and represented work in addition to that required under 43 CFR 3809.

21-18 Text revised.

21-19 Environmental consequences also include impacts upon mineral resources, in terms of exploration/development/production, as discussed in the PDEIS. The way in which the various alternatives impact mineral resources is considered to represent the manner in which "...environmental consequences can be addressed in the context of mineral resources."

21-20 See Figure 4-1 and Section 4.4, also Figure 4-2.

21-21 Text revised.

21-22 Fuel and oil have been included in the discussion of hazardous materials. See also Figure 4.6.

21-23 See text in Section 4.4.

21-24 See text in Section 4.4.

21-25 See text revision at beginning of Section 4.4.

21-26 See response 21-20.

21-27 See text in Section 4.4.

21-28 See revised text in Section 4.4.

21-29 See response 21-12.

21-30 The percentage of total visitor use attributable to each activity can be considered to reflect the overall relative importance of specific activities to current recreational users of the White Mountains NRA. Such information has been incorporated into the discussion of environmental consequences to recreation, Section 4.10.

21-31 Regional discussion has been included in revised Section 3.11.

21-32 Changes in government labor costs associated with regulation, enforcement, and management would be negligible, i.e., estimated annual labor costs would change by less than one workmonth for each alternative excepted.

Since the amount of change in recreation use cannot be predicted, we are unable to determine the corresponding change in recreation-related expenditures and employment.

21-33 Specific mitigation measures that may be incorporated into Plan of Operations have been included in Section 4.12. The administrative process for reviewing and approving plans are discussed in the Bureau Manual section on Surface Management under 43 CFR 3809.

21-34 See Section 2.3.1. BLM's policy with respect to bonding is set forth in 43 CFR 3809.1-9, see also Public Law No. 99-500.

21-35 Figure 4-8 has been revised.

21-36 Section 3.5 has been revised, incorporating new data on wetlands received from Corps of Engineers.

21-37 This is a function of the Corps of Engineers in their permitting process.

21-38 The Corps of Engineers conducts evaluations; see Section 3.5 and Appendix F.

PACIFIC LEGAL
FOUNDATION

COMMENTS ON BEAVER CREEK PLACER MINING DRAFT CUMULATIVE ENVIRONMENTAL IMPACT STATEMENT

Submitted by:

Ronald A Zumbrun
Robin L. Rivett
Kathleen Weeks
Pacific Legal Foundation
555 Capitol Mall, Ste. 350
Sacramento, CA 95814

James S. Burling
Pacific Legal Foundation
807 G Street, Ste. 200
Anchorage, AK 99501

Alaska Liaison Office: 807 G Street, Suite 200 • Anchorage, AK 99501 • (907) 278 1731

555 Capitol Mall, Suite 350 • Sacramento, CA 95814 • (916) 444 0154
Seattle Liaison Office 1200 One Market Union Square • Seattle, WA 98101 • (206) 447 7264

INTRODUCTION

Pacific Legal Foundation is a non-profit public interest law firm based in Sacramento, California with a branch office in Anchorage, Alaska. PLF has over 19,000 supporters throughout the United States and has the primary purpose of litigating in the public interest and in the defense of individual freedoms, private property rights, and the free enterprise system. PLF has represented the Alaska Miners Association and Miners Advocacy Council in litigation involving the BLM's regulation of placer mining on lands administered by BLM. Because of the importance of placer mining to the rural Alaskan economy, PLF makes the following comments on the draft cumulative environmental impact statement on the Beaver Creek watershed.

COMMENTS

The Bureau of Land Management (BLM) is to be commended for its timely and professional production of the Beaver Creek Placer Mining Draft Cumulative Environmental Impact Statement (DEIS). It represents a thorough job and analysis of cumulative environmental impacts from placer mining. PLF supports the proposed alternative because it will engender the least adverse impact upon the miners and the people in the Beaver Creek area with a concomitant insignificant impact upon the environmental resources of the area.

22 Continued

A. SUMMARY OF ALTERNATIVES AND ENVIRONMENTAL CONSEQUENCES:

It is noted that in the Summary of Alternatives and Environmental Consequences it is stated that "mining activities will create an irretrievable and irreversible loss on vegetation resources." Because natural revegetation and reclamation will ultimately occur the choice of words "irretrievable and irreversible" may not be strictly accurate. A time of reference should be added. 22-1

B. DESCRIPTION OF ALTERNATIVES:

The statement on page 2-13 that notes that requiring specific mining and reclamation methods is inappropriate is to be applauded. BLM correctly recognizes that mining and reclamation methods must be tailored on site specific bases. Under current state and federal regulations miners are trying a variety of innovative approaches to minimize impacts upon the environment. Miners should be assured the ability of continuing flexibility in meeting these standards.

In the Summary of Environmental Consequences of the Alternatives, starting at page 2-14, it is assumed that there will be five mines operating under the proposed alternative. Because of the current stringent nature of EPA regulations few miners share this optimistic scenario. Rather, they believe that there will be fewer than five operating mines. Therefore, the study of five mines represents an analysis of the environmental effects greater

then what is truly to be expected. Thus the analysis in some ways approaches that of a worst case analysis.

It is not suggested however, that BLM reanalyze its proposed alternative using fewer than five mines. By using a five mine scenario BLM will be able to refute any criticisms that it has insufficiently analyzed the total probable cumulative effects from mining. Furthermore, because the evidence demonstrates that the overall effect from five mines will be compatible with environmental values, the study helps demonstrate that mining does not have a significant adverse impact upon the environment when such mining is properly conducted.

22-2 On page 2-26 there is a chart demonstrating the effects of a worst case scenario. This section would benefit from further textual discussion.

C. <u>AFFECTED ENVIRONMENT</u>:

22-3 On page 3-36 it is noted that mining may have an adverse effect on moose habitat. Does this discussion account for the areas of moose browse that may be created by mining activities when an area once unproductive for moose habitat is mined and then reclaimed? On page 3-39 the effects on grayling are discussed. Under the current regulatory scheme imposed by EPA, BLM, and the Corps of Engineers, miners doubt that it is possible for mining to now have any significant effects on grayling habitat. Simple

channelization and placement of dredge tailings in stream beds is no longer an acceptable practice. Miners are no longer permitted to mine directly in streambeds, and miners must make an effort, when streams are rechannelized, to create environmentally acceptable streams.

On page 3-45 it is noted that modern mining techniques can be destructive of cultural and historical resources. Miners have traditionally been one of the most significant discoverers and preservers of cultural and paleontological resources in the state. 22-4
While modern equipment has the potential for being more destructive, what evidence is there that miners are destroying rather then saving such cultural and historical resources?

D. <u>ENVIRONMENTAL CONSEQUENCES</u>:
Beginning on page 4-1, the DEIS uses a mine scenario based upon an EPA report from 1987. In 1988 EPA issued their final placer mining effluent guidelines and accompanying economic analysis. 22-5
This latest 1988 study should be reviewed and changes made in the final EIS where appropriate.

On page 4-18 there is a photograph of river tailings. What is the date, place, and relevance of this photograph? It would not appear that miners could create such a scene as depicted here because of current regulations. 22-6

22 Continued

On page 4-39 the effects on aquatic habitats is discussed. One element frequently overlooked in such discussions is the positive impact on fish production created by additions into a stream of phosphorous and organic materials that invertebrates may feed upon. This should be discussed.

22-7 The discussion of the toxicity of sediments on grayling on page 4-41 is interesting. However, miners have often noted an abundance of grayling in areas of direct mining discharge. The report should discuss what, if any, actual in the field observations of relationships between grayling and placer mining have revealed.

22-8 Also on page 4-41 it is noted that "concentrations of arsenic, copper, lead, mercury, and other trace metals will increase in areas below mining activities." Under the current regulatory scheme proposed by EPA what is the likelihood that there will be such an increase in metal concentrates? It appears that the extensive recirculation and reduction in settleable solids mandated by EPA will make such increase in metals insignificant. These same comments apply for the citation of the report by Bjerklie and LaPerrier cited on page 4-42.

CONCLUSION

Overall, the Draft Cumulative Environmental Impact Statement represents a highly professional work from the BLM. The proposed alternative represents the best mix between the environmental

protection and the human needs of people who work in the Beaver Creek environment.

DATED: June 17, 1988.

Respectfully submitted,

RONALD A. ZUMBRUN
ROBIN L. RIVETT
KATHLEEN WEEKS
JAMES S. BURLING

By ______________________
JAMES S. BURLING

Attorney

22 Continued

22-1 See response 3-2.

22-2 See Appendix B-2.

22-3 See text additions, Section 4.6.6.

22-4 Significant paleontological and cultural resources have been uncovered by miners throughout Alaska. At times such discoveries have been appropriately preserved for their scientific and public interest. We are aware, however, that this is not universally true.

We will not use this EIS as a forum to identify specific miners who have been found guilty of destroying cultural or paleontological resources. We do not imply that wanton destruction of artifacts by miners occurs at an exceptionally high rate.

22-5 The BLM has reviewed EPA's final placer mining effluent guidelines and accompanying economic analysis and has determined that these guidelines would have no significant effect on BLM's analysis of placer mining impacts in the Beaver Creek drainage. BLM examined a wide range of effluent guidelines and water quality standards in the EIS for two reasons: 1) to better understand the significance of different water quality standards and 2) because EPA's effluent guidelines were not final. EPA's selection of guidelines different that those analyzed in the EIS will not impact BLM's selection of a Proposed Action.

22-6 See corrected caption; historic dredge tailings on Nome Creek, drawn from a photograph taken in June 1987.

22-7 Text revised, Section 4.7.

22-8 See response 20-6 and additions to Section 4.4.

United States Department of the Interior
NATIONAL PARK SERVICE
ALASKA REGIONAL OFFICE
2525 Gambell Street, Room 107
Anchorage, Alaska 99503 - 2892

IN REPLY REFER TO:

L7619(ARO-REC)

17 JUN 1988

Memorandum

To: State Director, Bureau of Land Management, Alaska State Office
Attention: Richard Dworsky

From: Acting Regional Director, Alaska Region

Subject: Review of the Beaver Creek Placer Mining Draft Cumulative Environmental Impact Statement (DES-88/19)

We have reviewed the subject document. Major issues addressed by our comments relate to the cultural resources evaluation, the evaluation of the potential effect on water quality, including the Beaver Creek National Wild River, and the evaluation of potential placer mining in the upper Beaver Creek watershed. Specific comments are enclosed.

The flow chart depicted in Appendix A-2 does not fully represent the placer mining review and permitting process of the National Park Service (NPS). We request the chart be revised to reflect the following information. While the NPS will accept the Annual Placer Mining Application as a notification of an operator's intent to conduct operations, that form does not have all the elements required of an operator for a mining plan of operations as specified in 36 CFR 9A. The NPS does not approve plans based only on the submission of that form. In some cases multi-year approvals are granted and those operators do not have to annually submit a plan of operations for review and approval. Additionally, NPS approval is not given until all other permits are acquired by the operator. It may be misleading to potential mining applicants to depict the NPS as a separate entity whose permitting action goes ahead irrespective of the permitting actions of the Corps of Engineers, Environmental Protection Agency, Alaska Department of Fish and Game, Alaska Department of Environmental Conservation and Alaska Department of Natural Resources.

We appreciate the opportunity to review the draft environmental impact statement. Questions about our comments may be directed to Larry Wright, Environmental Compliance Division, at 257-2649.

David B. Ames

David B. Ames

Enclosure

23 Continued

Enclosure: National Park Service Review Comments of the Beaver Creek Placer Mining Draft Cumulative EIS (June 17,1988)

A. CULTURAL RESOURCES

Summary of Alternatives and Environmental Consequences, Consequences section: It is stated, "Cumulative impacts on cultural and paleontological resources in the Beaver Creek drainage do not appear to be significant, in part because field inventory work in the area has not resulted in the discovery of significant remains." This argument is repeated throughout the document and is used to justify what appears to be a premature finding of no effect on cultural resources. 23-1

Section 3.8.1, page 3-42: West (1965) and Wills (1986) are cited as two sources of investigative work in the region. However, a review of these documents indicates that West was apparently not in the area containing the mining claims (upper tributaries of Beaver Creek) and Wills' investigation was limited to a general reconnaissance survey associated with a float trip down the Beaver Creek National Wild River.

Section 3.8.3, page 3-45: The discussion of mining history needs to recognize the 75 years (1863-1938) of qualifying historical archeological resources. The significance of these resources should not be dismissed with an unsubstantiated claim such as, "Prior to helicopter access, undisturbed cabins with artifacts undoubtedly existed, but most of these have been impacted." Helicopter access in itself does not destroy historic archeological resources. Topography, ground scatter, and privies are all important archeological manifestations that need to be evaluated on a case by case basis. 23-2

Section 3.8.4, page 3-45: There is a high potential for paleontological sites to exist and be discovered in the project area. The draft environmental statement needs to do more than recognize that little is known about these resources. We believe that the document can be improved to more adequately consider paleontological resources. 23-3

Section 3.8.5, page 3-46: A potential conflict between Section 106 of the National Historic Preservation Act and 43 CFR 3809.1 of the BLM regulations concerning the time allotted for legal compliance is identified in the environmental statement. We believe the discussion should recognize that Sections 106 and 110 of the National Historic Preservation Act take precedence over federal regulations. 23-4

Section 4.8.1, page 4-45: The proposed level of the cultural resources investigation needs to be reconsidered. The Class I Inventory can be accomplished by a literature search and 23-5

23-5 cont'd telephone call to the Alaska Heritage Resources Survey files to check on the existence of sites identified by the National Register of Historic Places. The draft environmental statement indicates there are no National Register sites listed for this region. Therefore, if the site investigation process stops with the Class I Inventory, it appears that any cultural resources located in unsurveyed areas are not going to be considered. The issue should be clarified by the environmental statement. Compliance with Sections 106 and 110 of the National Historic Preservation Act and 36 CFR 800 should also be addressed. We recommend that on-site cultural resources surveys that are consistent with federal law be conducted prior to the approval of any plan of operations in the project area.

23-6 Historical archeological concerns need to be addressed. The area has been used by Euroamericans for the past 125 years. A comprehensive and sensitive program for determining significance and for assessing direct impacts and cumulative effects on Euroamerican and ethnohistorical sites needs to be developed and implemented in the project area.

23-7 Section 4.8.6, page 4-47: It is stated that "Since no testing and little survey would be done prior to most surface disturbing activity on mining operations, there is a possibility that cultural or paleontological resources would be impacted or destroyed without the operators' knowledge" and "Historic mining resources, which are not generally protected by federal legislation, can and have been destroyed." These statements appear to indicate that the BLM does not plan to adequately survey for cultural resources prior to permitting mining operations. We are not aware of historic mining districts being excluded from the protection of the Section 106 process. Even the topography of the historic mining districts is considered a significant resource (Francaviglia 1988, "The Ultimate Artifact: Interpreting and Evaluating the Man-made Topography of Historic Mining Districts" by Richard V. Francaviglia, a Paper Presented at the Annual Meeting of the Society for Historical Archaeology). Plans should be made to conduct an adequate and appropriate investigation of cultural resources as required by the National Historic Preservation Act.

B. WATER QUALITY

Section 2.3.2, page 2-6: Regarding water treatment technology, we agree that the "zero discharge" requirement is preferable to requiring chemical treatment in the settling ponds. Cumulative impacts notwithstanding, use of the current standard of 0.2 ml/l of settleable solids and the "5 NTU standard" for turbidity in

the effluent is appropriate. Close scrutiny of the "plans of operation" during the various permit processes and a vigilant approach to inspection and monitoring can help assure compliance with these standards.

However, we do not agree with the BLM's use of alternative standards, such as the addition of mixing zones and variances. Alternatives should include only those that can be reasonably implemented by the agency involved in the permitting process. If, for example, the alternative performance standards under consideration were part of the regulatory structure under 43 CFR 3809, such alternatives would not be unreasonable. But, because they are primarily standards over which the BLM does not exercise regulatory control, they are inappropriate. Moreover, the EPA effluent limitation guidelines for placer mining were published as a final rule on May 24, 1988. That rule establishes the performance standards for placer mining. 23-8

The alternatives which depart from existing standards (alternatives A and B) also do not adequately comply with the EPA's anti-degradation policy (40 CFR 131.12). The policy requires states to, at a minimum, maintain water quality necessary to fully protect existing uses. It is the absolute floor for water quality protection (48 Federal Register 51,403 [1983]). In addition, there is an affirmative responsibility on the federal land manager (BLM) to protect the downstream Beaver Creek National Wild River (see Water Quality Standards Handbook (1983), page 2-14). The anti-degradation policy also applies to non-point source activities such as road building and other placer mining related actions. 23-9

The BLM should discuss what best management practices (BMPs) it intends to require of placer miners and what additional requirements would be dictated if water quality were to be degraded even after all reasonable and economically feasible BMPs have been applied. 23-10

Section 4.4.1, page 4-11: We recognize the difficulty in precisely determining the cumulative impacts of placer mining on the aquatic environment. However, after careful review, we question whether such impacts have been addressed sufficiently to choose an alternative which is consistent with protecting the water quality of Beaver Creek. For example, page 4-11 of the document shows that, for the proposed action, active mines and other construction processes associated with mining will contribute 17,310 tons of sediment annually to Beaver Creek, a 33% increase over the current non-point sediment load that results from forest runoff, existing abandoned mines and related construction. The effects of this increased sediment load upon water quality in Beaver Creek, including the national wild river 23-11

23-11 cont'd segment, are poorly documented in the draft environmental impact statement largely due to a lack of baseline data specific to the watershed. Since the average expected sediment load in "naturally occurring waters in this watershed" may be anywhere from less than 175 tons/day to 876 tons/day, it is not known whether the 343 tons/day figure estimated to result from the proposed action is twice the natural levels or less than half of natural levels. The environmental statement should address the effects from this predicted sediment loading.

We note these projections are for a point at the lower end of the Beaver Creek National Wild River, thereby ignoring sediment/turbidity plumes that may reach into the upper portions of the protected river segment. As presented, the analysis implies that portions of the Beaver Creek National Wild River will be used to dilute sediment and turbidity to acceptable levels further downstream. This is contrary to the BLM's White Mountains National Recreation Area management goal to protect and/or improve the water quality of the Beaver Creek National Wild River.

23-12 Section 4.4.1, page 4-12: For the above reasons, we disagree that the analyses presented in the water resources environmental consequences section are sufficient to conclude that the effects of sediment loading for the proposed action ". . . would probably be indistinguishable from expected natural conditions." This conclusion is also inconsistent with Section 4.7.1, page 4-43, which states that "Physical alteration and increases in suspended sediment from multiple mines in the basin constitute a cumulative effect upon the aquatic resources." Also, the statement on page 4-43 that "The overall cumulative effect of total suspended sediment increases in Beaver Creek cannot be determined" needs to be substantiated. In summary, the baseline water quality of Beaver Creek must be properly evaluated and stream sediment processes must be given further consideration before impacts of new placer mines upon aquatic resources and other values can be properly assessed.

23-13 The increase in sediment discussed above has important implications for chemical water quality since sediment from these disturbed sites typically transports higher levels of toxic metals than that originating from undisturbed forested areas. While the precise level of toxic metals introduced into the stream may not be known, further investigation of the literature should yield a more conclusive evaluation than the statement found on page 4-12, that "The impact on chemical water quality is unknown." Also, the information presented from the Birch Creek studies is insufficient for evaluating whether or not the

findings are transferable to Beaver Creek. In short, the evidence supporting the conclusion that "impact upon chemical water quality would not be expected to be significant" appears to be weak. The fact that the impact upon chemical water quality is unknown precludes the BLM from assuring protection of water quality in Beaver Creek, including the national wild river segment under the proposed alternative. **23-13 cont'd**

From the evidence presented in the environmental impact statement and from other available literature, it is reasonable to assume that, even with the zero discharge requirement and rigorous enforcement of effluent standards, any new mining operation will add increments of turbidity, settleable solids, and toxic metals to Beaver Creek. Such pollutants will have deleterious effects on water quality both during the mining process and for years afterwards due to non-point runoff. Also, evidence exists that these impacts may reach well into the Beaver Creek National Wild River (Sections 3.4.1, page 3-22, and 4.4.1, page 4-11). These effects are contrary to the "National Wild and Scenic River System; Final Revised Guidelines for Eligibility, Classification and Management of River Areas" (Federal Register, Vol. 47, No. 173, pp. 39454-39459) which call for maintaining water quality or, if needed, taking steps to assure that applicable Clean Water Act standards are met. Requiring large expenditures to prevent the last increment of sediment and turbidity in the effluent from entering the stream (such as in alternative C) seems inappropriate. It would be more cost effective to counter water quality and other resource degradation by requiring appropriate levels of construction and operation controls, reclamation requirements, and off-site mitigation (reclamation of abandoned sites in the watershed) to decrease the total load of sediment and turbidity in the system. In this approach, reclamation/construction methods are applied to the sources of sediment that are most readily controlled which would allow compliance with the national wild and scenic river guidelines. The preferred alternative and alternatives A-C should be adapted to include such reclamation/construction requirements, while the mechanism for implementing off-site mitigation requirements, as needed to further reduce impacts, already exists through the 404 permit process regulations. **23-14**

Section 4.9.1, page 4-51: The statement that reductions in fish populations in upper Beaver Creek will not notably affect subsistence fishing downstream is not supported by the fisheries information presented. This analysis needs to be strengthened. **23-15**

23-16 Consideration should be given to the revision of the alternatives, if necessary, to be in compliance with the EPA effluent limitation guidelines and anti-degradation policy. Given the approach used in the draft environmental statement, the alternatives should include a range of mining and reclamation practices that can assure the maintenance of Beaver Creek water quality and affirm the BLM's commitment to protect the Beaver Creek National Wild River.

23-17 A comment regarding wetlands is also appropriate. Executive Order 11990 (Protection of Wetlands) requires the BLM to minimize the destruction, loss, or degradation of wetlands and preserve and enhance their natural and beneficial values when carrying out their land management responsibilities. Chapter IV, Environmental Consequences, does not adequately address the loss of wetlands associated with the mining process nor does it discuss the indirect effects caused by movement of sediment and other pollutants downstream. The executive order also requires the BLM to show that no practicable alternative to the proposed action exists and that all economically and environmentally practicable measures are taken to minimize harm to wetlands resulting from the proposed action. The environmental statement needs to demonstrate compliance with the executive order. This would include a description of the potential effect of each alternative on wetlands and the identification of those measures being considered to minimize harm.

C. MINERALS MANAGEMENT

23-18 Section 1.1, page 1-1: The draft environmental statement discusses significant issues raised in scoping and lists five directives from various court orders and injunctions. However, it is not fully explained how the environmental statement addresses the specific requirement of the order of the U. S. District Court that the BLM consider or prepare ". . . an adequate EIS studying any cumulative or synergistic environmental effects of placer mining within the Beaver Creek watershed upon the Beaver Creek component of the National Wild and Scenic Rivers System."

We believe the court intended, as a major emphasis of the environmental impact analysis, that effects of placer mining on the Beaver Creek National Wild River be studied. This issue appears to become a problem in the environmental consequences discussion of cumulative impacts in Section 4.0, page 4-1, where it is stated: "The evaluation of cumulative impacts requires the integration of time, space, mining/non-mining, and federal/non-federal actions in a complex and dynamic environment. The

spatial aspect is covered by considering the impacts of multiple mining operations in the headwaters of Beaver Creek . . . ." It appears the court intended the scope of analysis to extend to effects on the national wild river. Limiting the "spatial aspects" of the cumulative analysis to the headwaters of Beaver Creek may not meet the requirement of the court's order. We recommend the scope of the spatial aspect of the cumulative analysis be expanded beyond the headwaters and into the national wild river corridor with an adequate evaluation of the effects of placer mining on all criteria for which the river was designated. 21-18 cont'd

Section 2.3.1, page 2-6: The map referenced as the "Placer Mining Operations and Access Roads Map" is actually in Chapter Three rather than Chapter One. 23-19

Section 2.5.1, page 2-15: The statement that "There should be no significant impacts on mineral resources" occurs here and on pages 2-17, 2-19 and 2-21. We question this statement since the environmental consequences section, page 4-4, appears to limit the scope of consideration of mineral resources to the occurrence of placer gold on existing claims in the Beaver Creek drainage. Also, the proposal and alternatives A through C project from three to five placer mines operating for the next 10 years. It appears that if mining occurred at those projected levels there would be impacts to "mineral resource availability for development." Further, the worst case scenario projects mining on 10 acres of each of the 131 federal mining claims with 26 mines operating annually. Yet Figure 2-8 shows no significant impact on development under the minerals component. Mineral operations occurring at that level in the project area would probably result in significant impacts. If information available to the BLM shows no significant impacts we suggest that it be presented in greater detail in the environmental statement. 23-20

In addition, it appears that in many analyses preexisting mining effects have not been considered. For example, in Figure 2-7 it is recognized that 352 acres of land were disturbed prior to 1981. However, by 1998, under the preferred alternative and with five mines operating, the total amount of disturbed land has been reduced to 115 acres. It appears that a more accurate assessment would be based on 347 acres of unreclaimed mine lands (312 unreclaimed acres in 1981 plus 35 additional acres). In accordance with the Council On Environmental Quality's definition of cumulative impact, we recommend that preexisting mining effects be consistently considered by the environmental analyses. 23-21

Enclosure: National Park Service Review Comments of the Beaver Creek Placer Mining Draft Cumulative EIS (June 17,1988)

23-22 Section 2.5.1, page 2-16: The statement that "Visual resources would be reduced slightly by the increased road mileage" occurs here and also on pages 2-18, 2-20 and 2-22. Since the proposal and Alternatives A through C project from three to five mines operating continuously for the next 10 years, it appears that there would also be an impact on the visual integrity of the area from placer mining impacts on streams, vegetation and water quality as well as increased additional impacts from new road construction. In addition to increased "road mileage" we suggest the environmental statement also consider the site specific and cumulative effects of mining on visual resources.

23-23 Sections 3.11, page 3-53, and 4.11.1, page 4-58: There appear to be contradictory statements made regarding the effects on visual resources. It is stated that,

> "Placer mining is taking place within the drainage bottoms where the landscape is visually sensitive, highly noticeable, and of the highest visual interest in the landscape. Observer position, sensitivity levels, and dominance factors all draw the eye to the area disturbed by mining and associated activities."

Individual mines ". . . 'should not attract attention or dominate the view of the casual observer' if they are well designed and executed." These statements appear to be inconsistent with the classification of the drainage bottom areas in VRM Class III, the description of visual intrusions as "moderate," and the acceptability of these intrusions.

23-24 Section 4.0, page 4-2: Appendix B-1 establishes the relationship of gold price to the number of miners and details a methodology for projecting operations and impacts. The gold price discussed on page 4-2 of $2,000 per ounce was not listed in Appendix B-2, "Assumptions for Worst Case Scenario." We question the suitability of a $2,000 per ounce worst case gold price. If gold were $2,000 per ounce other inflationary factors should also be considered such as the cost of fuel, equipment, materials and food. If such other factors were considered, they should be listed as assumptions in Appendix B-2.

Section 4.1.6, page 4-3: The exception for Alternative A in the first sentence appears to be an error. Alternative D is the no mining (or no new mining) alternative and projects the condition where there would not be "minimal alteration of original site aspect". The second sentence which states, "During mining, the
23-25 site aspect would be modified to some degree, dependent upon the particular situation; this might be obtrusive in some situations"

appears to conflict with the implication on page 2-16, 2-18, 2-20, and 2-22 that the impacts to visual resources are limited to those from road construction (see the above comment on visual resource impacts). We recommend that this discussion of unavoidable adverse impacts be collated closely with the discussion of visual resource and mineral resource impacts. 23-25 cont'd

Section 4.3, page 4-7: We suggest the statement that "The residual or indirect impact of each alternative would be the rate of recovery of the soils through different reclamation practices" be changed to read, "An indirect impact of the proposal and Alternatives A through C would be the effect on the rate of recovery of the soils through different reclamation practices." Since Alternative D projects no mining and Figure 2-7, page 2-25, shows zero acres reclaimed, there must be no residual or indirect impact through different reclamation practices. 23-26

23-1/2 West conducted a cultural survey in the higher country and caves in the White Mountains and found nothing of cultural significance. Will has done several helicopter and ground surveys of the White Mountains in the last nine years and has not found a single prehistoric site. Most of the cabin sites in the region have been recorded and are transient trapper/prospector sites with no significant artifactual material. Except for those reused over the years, or recently constructed, all are in advanced states of decay. Those sites which have undergone consultation with the SHPO have been determined ineligible to the National Register of Historic Places (NRHP). Those located on federal mining claims in the area are either in the same condition and are unlikely to be eligible to the NRHP, or are in use by the miner and are considered part of the mining activity.

23-3 While some potential always exists for the discovery of paleontological remains in mining areas, in Alaska, there is no reason to identify the Beaver Creek drainage as unusually "high." Frequently such remains are found unexpectedly and are not susceptible to reasonable efforts at discovery via archaeological techniques.

23-4 While there is a potential conflict between the 36 CFR 800 regulations which govern the procedure for implementation of the National Historic Preservation Act and the 43 CFR 3809 regulations which govern surface management under the general mining laws, BLM makes every attempt to comply with all federal laws and regulations dealing with cultural resources and mining.

23-5 BLM routinely does Class I inventory work (literature searches) which includes consideration of data from the Alaska Heritage Resource Survey. Additional inventory work, as appropriate, also is conducted in mining areas. Such work in 1988, for example, included on-site visits to active mining areas within the Beaver Creek drainage by a qualified BLM archaeologist. BLM's policy is to comply with the National Historic Preservation Act and its regulations found for Section 106 at 36 CFR 800.

23-6 Regarding historical archaeological concerns, we agree that a comprehensive and sensitive program for determining significance and assessing impact is desirable. (The same is true for prehistoric remains, as well.) Presently, given the nature of historical materials in the area (see 23-1/2 above), adherence to various federal laws, and particularly to regulatory procedures found at 36 CFR 800, we feel are realistic and adequate to accomplish these objectives.

23-7 Historic (i.e., mining) sites do exist in these drainages but are not necessarily appropriate for federal protection from impacts unless they can be determined eligible for the NRHP. "Man-made topography in historic mining districts," decayed cabins, ground scatter, and privies may be important archaeological manifestations but they rarely make the NRHP unless you have a significant complex or district. Nothing found on any of these mining operations in the Beaver Creek drainage has come close. (See also 23-1/2 above.)

23-8 The BLM recognizes the authority of the EPA and ADEC in this area under the Clean Water Act.

23-9 Alternatives A and B both provide better water quality (no variances) than EPA/DEC guidelines in effect at the time of analysis.

23-10 Best Management Practices are included in the discussion of specific mining and reclamation practices in Section 2.4.

23-11 See additions to Section 4.4 regarding the data base for sedimentation modeling.

23-12 Well-conceived documented sediment measurement work has not been conducted in Alaska stream waters for a long enough period, or under conditions which constitute an adequate comparison of mined and unmined waters and the relative contribution of sediment from various sources, to permit substantive judgments concerning aspects relevant to this EIS. Additionally, the short period of data collection has included substantial variations due to cyclic conditions such as rainfall, snowpack, surface vegetation, other sediment-causing activities such as roads, housing and various mining techniques. In other words several years of data do not produce the confidence levels needed to use them with any sense of validity. Recognizing this fact and the fact that the Resource Management Plan calls for monitoring and evaluation which should improve the data base, the EIS team developed a model of sediment based on EPA data. these data identify several classes of activities that result in sediment generation. The relative comparisons among and between these activities was used as a basis for the model. This model does not purport to be site-specific to this drainage. Rather, it indicates the magnitude of the problem by type of activity and allows relative comparison of the alternatives. It does place in perspective, however, the types of mitigation and surface management activities that need to be utilized to reduce sediment in waterways.

23-13 See text revisions.

23-14 Comment noted. see recommended alternative.

23-15 The analysis in the Fisheries Section, 4.7.1, states that direct effects of mining operating would be habitat degradation due to physical alteration and blockage of fish migration. It goes on to state that "clear water tributaries and other areas in the basin will continue to support all age classes and sizes, including fry of grayling and other species. The overall magnitude of adverse affects to fish populations is not possible to determine." Based on this information, it was judged that potential impacts to fishery resources are unlikely to be felt in those villages to any significant extent.

23-16 See response 22-5.

23-17 See text revisions in Section 3.5.

23-18 The analysis covers the entire watershed of the injunction; i.e., the drainage of the Wild River. The mining operations are located on tributaries in the headwaters of Beaver Creek.

23-19 Text revised.

23-20 The land management decisions regarding mineral resources and their development were made in the WMNRA RMP. This EIS primarily address the management of placer mining activities and it is in this context that there are no significant impacts on mineral resource availability for development. Figure 2-8, Summary of Worst-Case Scenario, was revised to reflect the reduction of gold resources due to high levels of mining activity.

23-21 Figure 2-7 and related text have been clarified.

23-22 The text has been changed to include mining operations.

23-23 These sections have been extensively revised; please see new material.

23-24 See text revision at the beginning of Chapter Four.

23-25 Section 2.5 has been revised to indicate that adverse impacts to visual resources will occur as a result of mining, as well as road condition.

23-26 Please see revised Section 4.3.

STATE OF ALASKA

OFFICE OF THE GOVERNOR

OFFICE OF MANAGEMENT AND BUDGET
DIVISION OF GOVERNMENTAL COORDINATION

STEVE COWPER, GOVERNOR

CENTRAL OFFICE
P.O. BOX AW
JUNEAU, ALASKA 99811-0165
PHONE: (907) 465-3562

SOUTHEAST REGIONAL OFFICE
431 NORTH FRANKLIN
P.O. BOX AW, SUITE 101
JUNEAU, ALASKA 99811-0165
PHONE: (907) 465-3562

SOUTHCENTRAL REGIONAL OFFICE
2600 DENALI STREET
SUITE 700
ANCHORAGE, ALASKA 99503-2798
PHONE: (907) 274-1581

NORTHERN REGIONAL OFFICE
675 SEVENTH AVENUE
STATION H
FAIRBANKS, ALASKA 99701-4596
PHONE: (907) 456-3084

June 20, 1988

Mr. Mike Penfold
State Director
Alaska State Office
Bureau of Land Management
701 C Street, Box 13
Anchorage, AK 99513

Dear Mr. ~~Penfold~~ Mike:

The State of Alaska has reviewed the Bureau of Land Management's (BLM) draft cumulative Environmental Impact Statement (DEIS) for placer mining on the Beaver Creek watershed. This letter is a consolidated response on behalf of the state Departments of Commerce and Economic Development, Environmental Conservation, Fish and Game, and Natural Resources. General and page specific comments are offered on the DEIS summary, first four chapters and appendices.

In general, the BLM has done a good job assembling data and producing a DEIS in one year. A great deal of environmental data, both past and present, was gathered for the DEIS effort. This alone makes the document valuable. The description of the affected environment and the environmental consequences is well done. However, the document could be improved by explaining more clearly the reasons for the selection of the Proposed Alternative.

The state commends the BLM for recognizing valid existing rights to mining claims in the Steese and White Mountain National Recreation Areas. BLM must develop a final EIS compatible with the goals Alaska National Interest Lands Conservation Act (ANILCA) established for these areas, which includes both conservation values and recognition of existing rights.

One of the State of Alaska's goals is to ensure that regulatory stability is achieved and a viable placer mining industry is maintained. To achieve this and prevent further impediments to placer mining in Interior Alaska, it is in the interest of the

01-A35LH

state that the Beaver Creek EIS on placer mining is consistent, complete, and complies with the requirements of National Environmental Policy Act and Section 810 of ANILCA. It is in this spirit that the state offers its comments. Many of the state's comments are technical in nature, either pointing out passages that are not clear or else noting areas of apparent inconsistency. We believe these comments will improve and strengthen the DEIS, and thus help guarantee its acceptance by the court.

On behalf of the State of Alaska, thank you for the opportunity to review this DEIS. If I can clarify the state's comments or answer any questions, please do not hesitate to call me or Barbara Sheinberg at 465-3562.

Sincerely,

Robert L. Grogan
Director

Enclosure

cc w/enc: Commissioner Brady, DNR, Juneau
Commissioner Collinsworth, DFG, Juneau
Commissioner Kelso, DEC, Juneau
Commissioner Smith, DCED, Juneau
Rod Swope, Office of the Governor, Juneau

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STATE OF ALASKA COMMENTS ON THE BEAVER CREEK DRAFT ENVIRONMENTAL IMPACT STATEMENT

SUMMARY SECTION OF DEIS
General Comments

This section summarizes the DEIS. Many of the comments and suggestions offered on other chapters of this document may result in further changes to this section.

Comments by Page

Page S-3, Proposed Action We recommend defining the term "zero discharge" in the first paragraph and in other chapters of the DEIS. This will avoid confusion and correct the apparent interchange of the terms "zero discharge" and "100% recycle" in the DEIS. Following are the state definitions for these terms:

> Recycle in placer mining operations is defined as the use of water from one of the settling ponds for the sluicing period. In 100% recycle, all process water used in sluicing is obtained from the settling ponds. Zero discharge is defined as no release of water back into a stream either through a pipe, an overflow or by visible seepage through a dam or tailings filter. Underground flow is considered a discharge if the water quality in the stream is measurably impacted. 24-1

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The last sentence in paragraph one states that BLM required zero discharge in the Beaver Creek area. However, paragraph three states that the Proposed Alternative, which is based on the status quo, assumes water quality performance standards that are different from zero discharge. This is confusing. We are not certain whether the Proposed Alternative or the sediment load modeling for the Proposed Alternative is based on zero discharge or on limits of 0.2 ml/l settleable solids and +5 Nephelometric Turbidity Units (NTU). Sections 2.3.2 and 4.4.1 again both indicate that the Proposed Alternative will require 0.2 ml/l and +5 NTU, but go on to state that zero discharge will be required. The final EIS should clearly explain what effluent guidelines are being selected in the Proposed Alternative and being used in the sediment load modeling.

Page S-4, para. 1; page S-5, para. 4; page S-7, para. 3 The sections on vegetation resources state that depending on the alternative, a certain number of acres will be sparsely vegetated at the end of the ten year period. The DEIS also states that reclamation will be done on all acres at the end of the mine life (assumed to occur at some point after ten years). The DEIS then states that this acreage would be an irretrievable and irreversible loss of vegetative resources. This conclusion is confusing 24-2

24-2 cont'd as it seems that at least part, if not most, of the reclaimed acreage would eventually revegetate. If this conclusion is correct, a better explanation is needed.

24-3 Page S-4 The text indicates that water treatment and reclamation costs for each mine are $26,000 and $10,000 respectively. However, the text on page 2-17 indicates these are cumulative costs for all five mines. This inconsistency should be corrected. If the per mine reclamation costs are $2,000 for the Proposed Alternative, this would be a cost of $660/acre or somewhere between three to six hours of heavy equipment work. This seems reasonable if it is assumed that the work is primarily recontouring after mining is complete. Has BLM considered that there may be additional incremental costs incurred during stripping and mining phases? This might include segregating topsoil and stockpiling coarse and fine tailings to achieve successful reclamation. Finally, Figure 2-6 is internally inconsistent showing per mine costs in the Proposed Alternative column for water treatment while showing cumulative costs in water treatment for Alternatives A-C.

24-4 Increased recreational access from new or improved mining access and BLM road construction is listed for Alternative A. This should also be listed for the Proposed Alternative.

24-5 Page S-6 The discussions of water treatment costs for Alternatives A-C are inconsistent with other areas of the text. Under Alternative A and B, the text indicates a cost of $36,500 for each of the four mining operations while page 2-17 and Table 2-6 seem to indicate $36,500 is a cumulative cost. Additionally, it is not possible to determine what BLM considers to be the current costs for water treatment, nor what technology the current costs represent. This should be clarified in the final EIS.

24-6 Alternative C selects water quality performance standards from the Environmental Protection Agency's (EPA) effluent guidelines. We recommend describing EPA's effluent guidelines in more detail. The sentence that states, "The water quality performance standards would be zero ml/l settleable solids and zero NTU turbidity above natural conditions," should be replaced with a more accurate description as found on page 4 of the state's comments. (This change should also be made on page 2-11 and anywhere else the EPA effluent guidelines are cited in the DEIS.) Since EPA's final effluent guidelines have been issued, BLM should change the final EIS accordingly.

24-7 Alternative C also focuses on the U.S. Army Corps of Engineers (Corps) reclamation standards. We understand that the Corps has asked that consideration of their standards be deleted from the EIS. If this is correct, Alternative C will probably need to be changed in the final EIS. We recommend that any revisions explain the reclamation standards selected in detail and discuss how they will be enforced.

DEIS CHAPTER ONE
Comments by Page

Page 1-2, Section 1.9 The state commends BLM's decision to let other agencies, including the Corps, use this EIS as a general document for reviewing work in the Beaver Creek watershed.

Page 1-6, Section 1.6 Add the "General Mining Law of 1872" to the list of laws that govern management in the Beaver Creek area. Also, rather than generally referencing "other regulations found in the Code of Federal Regulations," we suggest listing these regulations. 24-8

The first paragraph on page 1-6 states that ANILCA closed the area for further new placer claim staking under the 1872 Mining Law. The EIS could be improved by adding the following additional language for clarification, "This is true unless the Secretary classifies lands as suitable for locatable mineral exploration and development and opens such lands to entry, location and patent (ANILCA Title IV, Section 402(b)). Further, the Alaska Land Use Council is currently completing a nonrenewable resource inventory for federal lands in Alaska, that will help identify lands suitable for mineral exploration and development." 24-9

Page 1-7, Figure 1-2 Specify the applicable State of Alaska regulations as follows: 24-10

Agency	Legal Guidelines and Plans for Management	Responsibility of Agency	Enforcement Responsibility of Agency
State of Alaska	AS 16.05.840 AS 16.05.870 AS 46 and 18 AAC 30 31, 50, 60, 62, 64 70-72, 75, 80	Fish Passage Anadromous Fish Air, Land and Water Quality	State Standards

CHAPTER TWO - DESCRIPTION OF ALTERNATIVES
General Comments

The DEIS cumulative impact analysis was based on a ten year scenario. The state notes that many of the areas in Beaver Creek (eg. Nome Creek) have been mined multiple times and may be re-mined as gold recovery methods improve. Mining beyond a ten year period would likely extend some of the estimated short term impacts. The BLM should consider this while preparing the final EIS. 24-11

The Proposed Alternative and Alternatives A and B specify that during reclamation the stream bypass channel will be stabilized or reinforced to make it the permanent stream channel. Alternative C specifies that the stream bypass channel will be reestablished to the approximate original grade and configuration in the floodplain and reclaimed with rocks, pools, etc. When BLM 24-12

24 Continued

24-12 cont'd considers which alternative it will recommend in the final EIS, be advised that the Alaska Department of Fish and Game (ADFG) normally requires that the original stream characteristics be reestablished in anadromous streams. In resident fish streams (non-anadromous) the ADFG requires that the streambed and bank be reestablished upon completion of mining activities. Merely stabilizing a stream bypass (unless it is originally designed to approximate the original channel) can lead to further channelization of the area, loss of pool habitats, increased stream velocities, and possible barriers to fish migration (see attached bibliography for citations). We recommend that the final Proposed Alternative include provisions for compliance with ADFG requirements.

24-13 As mentioned in the state's comments on the DEIS summary section, the EPA has now issued the final effluent guidelines. These will become the baseline for effluent limitations for all miners beginning next year. The BLM may need to alter some of its alternatives accordingly.

24-14 The discussion of water quality performance standards throughout chapter two could be improved by being more specific about EPA and Department Environmental Conservation (DEC) responsibilities. The DEIS is confusing because it interweaves the two agencies' standards and roles. The following two paragraphs explain these agencies' respective responsibilities more clearly and should be used on pages 2-6, 2-7 and throughout chapter two and other portions of the DEIS where appropriate.

EPA regulates effluent. The EPA effluent guidelines specify that open-cut mines that process over 1500 cubic yards of ore per year must have a resultant volume of process wastewater which does not exceed the volume of infiltration, drainage and mine drainage waters that is in excess of the make-up water required for operation. The concentration of pollutants in discharged process wastewater must not exceed an instantaneous maximum settleable solid limit of 0.2 ml/l.

The DEC regulates water quality relative to discharges to the lands and waters of the state. The current water quality standard allows no increase in concentration of sediment, including settleable solids, above natural conditions measured below the discharge. Water quality standards for turbidity provide for an increase of 5 Nephelometric Turbidity Units (NTU) above background as an instantaneous maximum, measured below the discharge. National Pollutant Discharge Elimination System (NPDES) permits may provide for an increase in the turbidity limit in the effluent based upon expected dilution. The background sample is measured in the stream at a point above the confluence of the effluent and the stream.

Comments by Page

Page 2-2 We assume that "undue and unnecessary" activities are those which are not customary and prudent placer mining activities. 24-15

Page 2-4, para. 2 Delete the last sentence of this paragraph which states, "These are mitigating measures which ADEC, EPA and ADFG apply to priority streams in order to attain state water quality standards." Delete this sentence because it is misleading. The state applies several of these mitigating measures (e.g., stream bypass, settling ponds, etc.) to all mining projects regardless of their location (priority stream or not). 24-16

Paragraph four on this page discusses zero discharge. Again, the definition is vague and confusing. We recommend that a precise definition such as the one offered on page one of the state's comments be used consistently throughout the DEIS. 24-17

Page 2-6 The third line on this page should reference the map in Chapter Three, not One. 24-18

Page 2-7 (also stated on other pages) The authors state, "The water quality performance standards would be the current EPA/DEC standard of 0.2 ml/l settleable solids and the 5 NTU turbidity standard when measured 500 feet below the mine discharge point." We recommend BLM revise this sentence for accuracy in accordance with the two paragraphs presented in the state's general comments for this chapter on page 4. This sentence is additionally confusing because there is no blanket provision for measurement 500 feet below the mine discharge point. 24-19

Page 2-10, Figure 2-5 This figure shows the requirements for disposal of human waste as being "keep out of the stream." However, Alaska wastewater disposal regulations (18 AAC 72.021) require a 100 foot setback from surface waters and a four foot separation distance above groundwater, e.g., pit privies. Figure 2-5 should be changed accordingly. 24-20

Page 2-12, Section 2.3.6 It would aid miners and other DEIS reviewers if the proposed mining claim validity examinations to be conducted by BLM under Alternative D were described in detail. If this is a lengthy description, we suggest it be included as an appendix. 24-21

Page 2-15, Section 2.5.1 The DEIS discusses water quantity and quality changes as follows: 24-22

> Water quantity would not be significantly affected and water quality would return to approximately natural conditions after successful stabilization of the disturbed area and stream channel. Unavoidable adverse impacts would be significant short- to long-term increases in suspended sediment and turbidity, and accelerated erosion resulting in

24 Continued

a possible increase in sediment (343 tons per day) introduced to the stream system, and changes in channel morphology (1.25 miles) in the vicinity of the disturbed area. Short- and long-term impacts are not expected to be significant downstream on Beaver Creek. The impact on chemical water quality is not expected to be significant.

24-22 cont'd

Pages 2-17, 19 and 21 (corresponding to Alternatives A, B and C) have the same language but with varying estimates of sediment load and channel morphology changes (due to changes in water quality and reclamation performance standards and the predicted number of mines). Since the degree of impact is tied to an assumption that each Alternative's stated reclamation standard will be attained, we recommend that BLM specify how it will ensure compliance with the reclamation standards.

24-23

In these paragraphs on pages 2-15, 17, 19 and 21, it is not clear how much of the sediment load is due to point versus non-point sources. Elaborating on this will help reviewers understand how much of the sediment load is due to actual mining. Since "zero discharge" was required in 1987 and the Proposed Alternative recommends continuation of the status quo, do we assume that the predicted 343 tons/day of sediment is all from non-point sources?

24-24

Page 2-24 to 2-26, Figure 2-7 Prior to 1981 when neither reclamation nor topsoil conservation was required, 352 acres of habitat were physically altered by mining and 44 acres of habitat were considered to be permanently lost (13 percent). Under the Proposed Alternative, which requires reclamation and topsoil conservation, habitat disturbance is estimated at 676 acres with a permanent habitat loss of 202 acres (30 percent). Why does the percentage of permanent lost habitat increase when reclamation and other mitigation factors are put into effect?

24-25

The maximum miles of aquatic habitat disturbance is estimated to be 1.25 miles. We recommend that the figure or text cite something for comparison to give perspective to this impact. For example, what is the total mileage of streams of the same stream order or higher in the Beaver Creek watershed? What is the percentage of total stream or watershed mileage that is disturbed?

24-26

The 1987 mine employment is indicated as two person-months with direct income valued at $3,000. The five mine scenario of 40 person-months and $48,000 income are not multiples of five. Do we assume that the five mines are of significantly increased activity level? This discrepancy should be explained or corrected.

24-27

No effort was made to quantify gross expenditures of the operations and the effects on Fairbanks and other communities. While the impact is small compared with that of the Birch Creek mining industry, it should still be estimated and discussed. The Hagler Bailly contractors report should provide information for making this estimate.

CHAPTER THREE - AFFECTED ENVIRONMENT
General Comments

The discussion on sediment loads is very confusing. We recommend consistently using either tons/year or tons/day. It is not clear how the sediment load figures were derived. In addition, field observations yield different sediment load data than that derived from BLM's model. Several questions and areas of confusion are discussed below. We recommend that the sediment load sections be reviewed for accuracy, clarity and consistency. 24-28

It is not clear which water quality performance standards were used in the sediment load modeling. It appears that the model is based on 100% recycle. Further confusion occurs because 100% recycle is not defined. We recommend that BLM explicitly state the assumptions and definitions used in the sediment load modeling in the final EIS. 24-29

When reviewing the model and data generated, several apparent inconsistencies were noted. According to Figure 3-2 (page 3-21), the annual sediment load contribution from the one active mine in 1987 was 240 tons per year. However, the 1987 total in Figure 2-7 is 273 tons per day. (Again, the use of both the terms "tons per day" and "tons per year" is confusing.) Based on a 200 day open water season this is 1.2 tons per day (tpd). This is an increase of seven tpd above the nonmining background of 256. 24-30 Why is it not 257.2 tpd (256 + 1.2)? Figure 4-1, cites a total annual sediment load of 6,000 tons, which is six tpd per mine. There is no explanation included for why the per mine total is assumed to be six tpd versus 1.2 tpd (1987) when requirements between 1987 and the Proposed Alternative are essentially identical. 24-31

Figure 2-7 indicates a sediment load increase above the no-mining background of 87 tpd (343-256). If the five mines each contribute six tpd, the increase would only be 30 tpd. Evidently sediment loading from construction is attributed to non point sources such as mining access, but this has not been disaggregated or explained. Assuming that there is "zero discharge", the mine contribution must come from non-point sources including run-off. Is this inference correct? 24-32

In the worst case analysis presented for sediment loading (page 4-11, Figure 4-1), the predicted sediment loading rates do not seem to take into account possible enforcement limitations and system upsets which may occur. From the analysis it appears that the water quality projections, based on the alternative mining scenarios, may be optimistic. 24-33

The sediment loading data is presented without a discussion of the sediment transport capacity of the specific alluvial environment in question. Sediment transport capacity and actual sediment load differences can cause either deposition or scour of a stream bed to occur (Lane, 1955b). The dynamics of a stream

system depend on the complex relationship of several hydraulic variables including 1) stream discharge, 2) longitudinal slope, 3) sediment load 4) resistance of banks and bed to movement of flowing water, 5) vegetation 6) temperature, 7) geology, and 8) human disturbance (Heede, 1980). The sediment load that any stream can carry depends on these factors. The final EIS should address these issues and consider the alluvial environment downstream. For example, placer mine settling ponds are designed to retain all sediment minus 0.02 mm in size (DEC). If the alluvial environment downstream from the settling pond has a level of quiescence lower than that of the settling pond, then some of the remaining suspended sediment load could settle out. Without any discussion of the sedimentary environment of the streams in question the DEIS does not relate sediment loading to its possible or assumed environmental consequences.

24-29 cont'd

Finally, the state notes that while modeling is a useful tool, any model is only as good as the input variables. Apparently the BLM model used a water quality performance standard of 100% recycle. Thus it is not surprising that the model's predicted sediment loads are substantially less than what has been previously observed in the field where there are mining operations in various levels of compliance with existing water quality standards. However, it still should be noted that the DEIS model may significantly underestimate total sediment loading from the five placer mines if total compliance levels are not achieved.

On pages 3-21 and 4-11, the DEIS estimates that 40,392 tons of sediment per year will be naturally generated from undisturbed forest ecosystems. These estimates are apparently based on an EPA model developed from observations within the lower 48 states and collaborated with the sediment loads calculated from the 100 to 500 mg/l total suspended solids (TTS) concentrations reported for natural waters (Selkregg, 1974). The TSS concentrations utilized in the model are significantly higher than those reported for actual field measurements in Interior Alaska. These observations are detailed below.

Investigations by Mack (1986) (Using turbidity to predict total suspended solids in mined streams in Interior Alaska, Public Data File 86-84: Pages 18 and 19) found TSS concentrations in the Tolovana River at the Elliot Highway crossing (above mining) in 1984 and 1985 ranged from 0.5 mg/l to 24 mg/l with an average of 7.86 mg/l (n=9). Similar investigations by Mack, et. al. (1987, Page 31) at the Tolovana River highway crossing in 1987 found TSS ranged between 0.64 mg/l to 721 mg/l with an average of 52.58 mg/l (n=15). The 721 mg/l sample occurred during a single major rainstorm event. When excluded from the average, the TSS in 1987 ranged between 0.64 mg/l to 25.1 mg/l with an average of 4.84 mg/l (n=14).

Dames and Moore (1985) reported that the TSS for three watersheds unaffected by placer mining activity (Twelvemile, Page 11, four

24 Continued

samples averaged 31.5 mg/l; McManus, Page 25, two samples averaged 1.5 mg/l; and Caribou, Page 31, nine samples averaged 9.11 mg/l) ranged between 0 mg/l to 47 mg/l for the 15 samples.

Spring breakup water quality sampling conducted annually since 1984 by ADFG (unpublished) for both mined and unmined drainages (Table 1) found TSS concentrations in unmined watersheds ranged between 12.1 mg/l to 56 mg/l with a five year average of 35.6 mg/l. TSS in mined or previously mined watersheds ranged between 128 mg/l to 449.7 mg/l with a five year average of 194.7 mg/l. In contrast, the TSS for the Tanana River (glacial influence) ranged between 189 mg/l to 582 mg/l with an average of 425.3 mg/l.

Comments by Page

Page 3-14, para. 5 Delete the last sentence of this paragraph which states, "The state and EPA have not rigorously enforced this standard at most mine locations (Hagler, Bailly and Company 1987)." Delete this sentence because it is misleading. The state routinely works with miners, presents workshops etc. on classification, clean water bypass, tailings filtration, etc. to help achieve the turbidity standard. All these techniques and others are potentially available to all miners in all streams. **24-34**

Page 3-21 The DEIS states, "The current standard is that no more than a trace (0.2 ml/l) of the sediments drop out of a column of water that remains still for one hour." To avoid confusion, delete the word "trace" because a trace is a few grains of sediment (an unmeasurable amount) at the bottom of an Imhoff cone, not 0.2 ml/l. Also, revise the beginning of the sentence for accuracy to read, "The current effluent standard is that ...". **24-35**

Page 3-33 The state recommends that all mining operations completely remove or burn refuse to the degree possible. Mine operators should report any human/bear conflicts occurring in the vicinity of active mines to ADFG. Immediate reporting and surrender (to ADFG) of any bears killed in defense of life or property is also required under 5 AAC 92.410. These items should be mentioned in the final EIS. **24-36**

Page 3-36 The last sentence of the conclusion could give the impression that 32-34% of the moose late winter habitat in the Beaver Creek watershed is impacted when it appears to mean that 32-34% of the habitat in the Nome Creek watershed is impacted. The significance of this loss in the Nome Creek watershed would be easier to appreciate if it were also given in terms of the percentage of moose late winter habitat in the Beaver Creek watershed. **24-37**

Page 3-41 Units for dissolved, suspended and total solids should be mg/l not ag/l. **24-38**

24-39 Page 3-46, Section 3.9 The citation to Caulfield et al. 1983, is not listed in the bibliography. This should be corrected. The stated percent of Alaska's population that is Alaska Native is based on 1980 census data. The overall population figures however, are from 1984 Department of Labor estimates. A common source for both figures should be used so that these numbers can be compared.

24-40 Page 3-48 The last reference in the first paragraph of the section on moose is ADFG 1987a. This citation is incorrect and should be Sumida and Alexander 1985.

24-41 Pages 3-48 and 3-49, Subsistence Use Maps The inclusion of qualifiers for the ADFG Subsistence Division's mapped information is appreciated. However, it appears that much of the information presented is derived from the Slaughter report since neither of the cited Subsistence Division reports contain this broad of an area.

Map One does not include all the areas depicted on the Subsistence Division maps for these communities. It appears that the DEIS only depicts information for the Beaver Creek drainage. This is misleading as the maps could be interpreted to indicate that no subsistence use occurs in the surrounding areas, which is not the case. A qualifier noting this limitation should be included on the maps. In addition, the Subsistence Division has mapped information for the community of Beaver that should be included.

The Sumida and Alexander report does not contain any mapped information for the categories listed in Map Two. The Caulfield report does not distinguish between salmon fishing and other fish species. The depicted salmon fishing areas are inaccurate as salmon fishing primarily occurs along the main channels of the Yukon River. These discrepancies should be corrected in the final EIS.

24-42 Page 3-49, para. 2 The ADFG 1987a citation is incorrect. The correct citation is most likely ADFG 1987b. In addition, the reference to the 1987a Subsistence Map Catalog does not appear to be cited correctly anywhere in the subsistence section.

24-43 Page 3-49, Furbearers Section The section on furbearers cites Caulfield as stating that time and effort spent trapping depends largely on fur prices. However, while Caulfield (1983:78) does state, "Fur prices apparently have an influence upon the extent of trapping activity.", this does not imply that this is the sole important factor. To clarify, we suggest adding the following sentence to the end of the first paragraph, "Other factors such as environmental conditions, availability or resources, abundance and health of furbearer populations, and socioeconomic considerations also effect subsistence trapping activities."

Caulfield is cited in the second paragraph as stating that current low prices for muskrat means few people harvest them except for food. However, in his report Caulfield went on to explain, "Increased prices have reportedly stirred renewed interest in muskrat harvest in recent years." This should be noted in the final EIS. Finally, the DEIS cites DEC as noting that lynx are rarely trapped. However, unpublished ADFG Subsistence Division studies in the area have found that lynx is usually the second-most common species harvested (after marten). We recommend that the BLM check with the ADFG Game Division fursealing records to resolve this discrepancy. **24-44**

Page 3-52 Visiting mine sites may enhance tourist's understanding of mining, but it should be stressed that uninvited visits create conflicts beyond simple interference and distraction. As in any industrial setting, the safety of the visitor and liability of the mine operator are of primary concern. Any site visitors are required by the Mine Safety Health Administration to be given safety briefings. The presence of strangers on site and the potential for theft and vandalism is also of concern to operators. **24-45**

Pages 3-53 to 3-55, Section on Economics The ranking of placer mining with all other industries (page 3-53), including secondary industries, is similar to comparing the number of seed potatoes with the total crop. If it is necessary to leave the comparison in the section, a much clearer and stronger explanation of the fundamental relationship between basic and secondary industries should be included (this is provided in paragraph three of the suggested text below). Otherwise, placer mining should be compared with other basic industries. The information to do this can be found in Todd and Weddleton, 1986.

The economics discussion on pages 53-54 does a poor job of describing the role of placer mining in the economics of Interior Alaska. The following text is suggested to strengthen this section. This text is general and could be used in all of BLM's EISs on placer mining. **24-46**

> The Alaska placer mining industry expended an estimated $75 million for labor, goods and services in 1985. Of these expenditures, approximately $64 million were made in Alaska. The industry was estimated to have directly employed 2,200 people on at least a part time basis. When calculated on a 12-month basis, the direct industry employment is the equivalent of over 800 full-time jobs. An equal number of jobs was estimated to be created in the state's support and service industries for a total employment of over 1,600 jobs in Alaska. The indirect jobs created in other states was not estimated. (Peterson 1986)
>
> Of particular note, 34 percent of direct placer mining employment by person-years was for residents of rural Alaska. Residents of Fairbanks accounted for 31 percent of

the employment, while Anchorage and states outside Alaska accounted for 16 percent and 19 percent respectively. (Peterson 1986)

When compared with all industries in the state including support industries, placer mining ranked 52nd in terms of total payroll. The support industries, which would include stores, business services, doctors, gas stations, etc. are defined as industries which are dependent on the basic industries. Basic industries in Alaska are considered to be those that bring new money into the state such as the oil and gas, tourism, fishing, forestry and mining industries. Federal military and government spending are also included as they too bring new money into Alaska though they are not traditionally referred to as industries. When federal spending is excluded, placer mining ranks fifth behind oil, seafood, tourism and gas in terms of the gross value of the state's basic industries. (Todd and Weddleton 1986)

Placer gold production in 1985 was estimated to be 188,500 refined ounces. Placer production of refined gold in 1986 and 1987 was estimated to be 155,500 oz and 223,300 oz respectively. The number of placer mines in Alaska dropped from 296 in 1983 to 192 in 1986. In 1987, 199 placer mines were operational. The dramatic increase in gold production in 1987 is due to the expanded operations of several of the states largest mines. (Bundtzen 1983-1987)

24-46 cont'd

Fairbanks is the primary supply and service center for the four drainages effected by the lawsuit as well as for the other Interior Alaska mining camps. The direct expenditures made in Fairbanks by placer mines for labor, goods and services in 1985 were estimated to be $27 million. (Peterson 1986). Though no equivalent comparison is available for 1985, the annual direct expenditures made by the tourism industry in Fairbanks for October 1985 through September 1986 was estimated to be $44 million (Data Decisions, 1987). Though placer mining is less visible than tourism, the comparison highlights its relative importance to the community during those years.

However, since 1985, two of the Interior mining districts serviced and supplied, by Fairbanks have seen significant drops in activity. In the Kantishna district, 17 placer mines were enjoined from operating in 1986 by a lawsuit against the National Park Service and remained closed in 1987. In the Circle mining district, the number of placer mines declined from 40-50 in the early 1980's to 21 in 1986. Overall, the number of placer mines in the Eastern Interior of Alaska has declined from 180 in 1983 to 81 in 1987. (Bundtzen 1983-1987). The level of expenditures and employment in Fairbanks and rural communities serving Interior mining districts has certainly also declined though no economic surveys have been made since 1985. This has

undoubtedly had a significant impact on Fairbanks and neighboring communities. **24-46 cont'd**

CHAPTER FOUR - ENVIRONMENTAL CONSEQUENCES

General Comments

This chapter analyses the environmental consequences of the various BLM alternatives. Under each alternative including the Proposed Alternative, it is noted that land stripping, mine cuts, and the construction of roads will result in unavoidable adverse impacts to riparian wildlife habitats for periods of 25 to 50 years or more. While the state recognizes that short-term impacts will result from riparian land clearing operations, the final EIS should emphasize that with proper reclamation, partial to full recovery may occur as early as give years following successional vegetation (see Figure 4-3). The EIS should further emphasize that land clearing activities within climax successional areas (black spruce, permafrost, bog areas) may actually increase available moose winter range following proper reclamation for periods of five to 40 years. **24-47**

Comments by Page

Pages 4-47 to 4-55, Section 4-9 The discussion on impacts to subsistence appears to be largely based on the assumption (expressed in chapter three) that wildlife populations and fish stocks in the upper drainage are distinct and separate from those in the lower portion of the drainage where most subsistence use activity occurs. A joint ADFG-U.S. Fish and Wildlife Service moose telemetry study identified two moose populations in the area that appear to be resident year-round in the flats. Another moose population was identified, however, that has broad movement patterns from the flats into the White Mountains. When preparing the final EIS, the BLM should consider that mining related activities within the upper Beaver Creek watershed may affect moose populations which are available and utilized for subsistence in the lower Beaver Creek watershed. **24-48**

APPENDICES

Comments by Page

Page A-4 The text in Appendix B-1 refers to gold prices reaching $600/oz by 1999. Does the Proposed Alternative assume that mining activity increases immediately as a result of a $600/oz level, resulting in the four additional mines? We assume that the $600/oz price increase is in 1987 dollars. If that is the assumption, it should be so stated. An annual price inflation rate of 2.5 percent would raise the gold price from $475 to $608 in ten years. If operating costs inflated at the same rate, gold mining would be no more attractive in ten years at $600/oz than it is at the present. **24-49**

Page A-17, last line The word "ourselves" is redundant and should be deleted. **24-50**

TABLE 1. ADFG ANNUAL SPRING BREAKUP WATER QUALITY SAMPLING ANALYSIS FOR TOTAL SUSPENDED SOLIDS (TSS), 1984 to 1988

Location	Mined Unmined	1984A	1984B	1985	1986	1987	1988	5-Yr. Avg.
Tolovana 1	Mined		30	238	73	78	94	102.6
Livengood	Mined	525	890	757	466	821	668	683.9
Chatanika	Mined	69	84	227	125	21	198	128.0
Gilmore	Mined	118	130		160	51	52	96.8*
Goldstream	Mined	90	645	726	89	508	32	344.5
Little Chena	Mined	68	164	258	43	18	32	93.4
Chena 1	Mined	54	32	47	37	26	51	40.8
Chena 2	Mined	71	12	86				63.8**
Cripple	Mined	235	2060	226	31	21	4.8	286.1
Tatalina	Unmined	16	70	53	10	15	33	30.8
Tolovana 2	Unmined	10		24	80	9.2	79	40.4
Tanana	Glacial				505	189	582	425.3***
AVE. Mined		153.8	449.7	320.6	128.0	193.0	141.5	194.7
AVE. Unmined		13.0	35.0	38.5	45.0	12.1	56.0	35.6

Sample Dates:

1984 A - 5/09/84
1984 B - 5/15/84
1985 - 5/15/85
1986 - 5/12/86
1987 - 5/07/87
1988 - 4/27/88

Notes:

* 4 Year Average
** 2 Year Average
*** 3 Year Average

Sampling Locations:

Tolovana 1 = TAPS crossing
Tolovana 2 = Elliot Highway Bridge (Upstream Side)
Livengood = 30 ft. downstream from old Elliot Highway Bridge
Tatalina = Campground between old and new Elliot Highway bridges
Chatanika = 15 ft. downstream from Elliot Highway bridges
Gilmore = 1/2 mile above Steese Highway
Goldstream = 150 ft. downstream from Old Steese Highway
Little Chena = Under Nordale Road bridge
Cripple = Under bike path on Chena Pump Road
Chena 1 = Boat landing above Nordale Road bridge
Chena 2 = (1984) ADNR Helicopter Pad; (1985 on) Small Tract Road
Tanana = Chena Pump Road landing

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Bibliography

Anderson, B.W. ; Ohmart, R.D. 1985. Riparian revegetation as a mitigating process in stream and river restoration. Pages 41-79 in J.A. Gore, ed. The Restoration of rivers and streams : theories and experience. Chpt. 3. Butterworth Publishers, Stoneham, MA. (ADF&G, Habitat Library, #R5157.)

Anderson, J.W. ; Ruediger, R.A. ; Hudson, Jr., W.F.. No date. Design, placement and fish use of instream structures in southwestern Oregon. USDI Bureau of Land Management, Coos Bay, Oregon. (ADF&G, Habitat Library, #R5152.)

Anderson, J.W. ; Ruediger, R.A. ; Hudson, Jr., W.F. 1984. Design, placement and fish use of instream structures in southwestern Oregon. Pages 165-180 in T.J. Hassler, ed. Proceedings : Pacific Northwest Stream Habitat Mangement Workshop, Oct. 10-12, 1984, Humboldt State University, Arcata, California. (ADF&G, Habitat Library, #R5164.)

Brusven, Merlyn ; Trihey, E. Woody. 1978. Interacting effects of minimum flow and fluctuating shorelines on benthic stream insects. (ADF&G, Habitat Library, #B6314.)

Blench, T. 1972. Effects of river uses : morphometric changes. Pages 287-308 in R.T. Oglesby, C.A. Carlson, and J.A. McCann, eds. River ecology and man ; proceedings of an international symposium on river ecology and the impact of man, held at the University of Massachusetts, Amherst, Mass., June 20-23, 1971. Academic Press, New York, N.Y. (ADF&G, Habitat Library, #R5184.)

Blewett, E. 1984. Salmonid habitat evaluation model : S H E M. Pages 301-318 in T.J. Hassler, ed. Proceedings : Pacific Northwest Stream Habitat Management Workshop, Oct. 10-12, 1984, Humboldt State University, Arcata, California. (ADF&G, Habitat Library, #R5169.)

Burgess, Stephen A. 1985. Some effects of stream habitat improvement on the aquatic and riparian community of a small mountain stream. Pages 223-246 in J.A. Gore, ed. The Restoration of rivers and streams : theories and experience. Chpt. 8. Butterworth Publishers, Stoneham, MA. (ADF&G, Habitat Library, #R5158.)

Burkhard, W.T. 1967. Effects of channelization on the trout fishery of Tomichi Creek. Colorado Game, Fish and Parks Dept., Denver, Co. Federal Aid Proj. F-26-R-4. 9 pp. (ADF&G, Habitat Library, #B1881.)

Committee on Government Operations. 1973. Stream channelization: what federally financed draglines and bulldozers do to our Nation's streams: fifth report. U.S. Govt. Print. Off., Washington, D.C. 93rd Congress, 1st session no. 93-530. 139 pp. (ADF&G, Habitat Library, #B1772.)

Covich, A.P., et al. 1978. Effects of fluctuating flow rates and water levels on chironomids : direct and indirect alterations of habitat stability. Pages 141-156 in J.H. Thorp and J.W. Gibbons, eds., Energy and environmental stress in aquatic systems. Tech. Info. Cntr., U.S. Dept. of Energy, Oak Ridge, TN. (ADF&G, Habitat Library, #R3927.)

Doyle, J.E. 1984. Habitat enhancement on off-channels and terraced tributaries in Puget Sound River systems. Pages 81-96 in T.J. Hassler, ed. Proceedings : Pacific Northwest Stream Habitat Management Workshop, Oct. 10-12, 1984, Humboldt State University, Arcata, California. (ADF&G, Habitat Library, #R5160.)

Everest, F.H. ; Sedell, J.R. 1984. Evaluating effectiveness of stream enhancement projects. Pages 246-256 in T.J. Hassler, ed. Proceedings : Pacific Northwest Stream Habitat Management Workshop, Oct. 10-12, 1984, Humboldt State University, Arcata, California. (ADF&G, Habitat Library, #R5168.)

Funk, J.L., and J.W. Robinson. 1974. Changes in the channel of the lower Missouri River and effects on fish and wildlife. Missouri Dept. of Conservation, Jefferson City, Missouri. Aquatic Sers. No. 11. 52 pp. (ADF&G, Habitat Library, #B1908.)

Gore, J.A. 1985. Mechanisms of colonization and habitat enhancement for benthic macroinvertebrates in restored river channels. Pages 81-101 in J.A. Gore, ed. The Restoration of rivers and streams : theories and experience. Butterworth Publishers, Stoneham, MA. (ADF&G, Habitat Library, #R5156.)

Gunderson, Donald R. 1968. Floodplain use related to stream morphology and fish populations. Journal of Wildlife Management. v. 32(3):507-514. (ADF&G, Habitat Library, #R4575.)

Hall, J.D. 1984. Evaluating fish response to artificial stream structures : problems and progress. Pages 214-221 in T.J. Hassler, ed. Proceedings : Pacific Northwest Stream Habitat Management Workshop, Oct. 10-12, 1984, Humboldt State University, Arcata, California. (ADF&G, Habitat Library, #R5166.)

Hecky, R. E. ; McCullough, G. K. 1984. Effect of impoundment and diversion on the sediment budget and nearshore sedimentation of southern Indian Lake. Canadian Journal of Fisheries and Aquatic Science. v. 41(4):567 578. (ADF&G, Habitat Library, #R4235.)

Heede, B.H. 1981. Rehabilitation of distrubed watersheds through vegetation treatment and physical structues. Pages 257-268 in D.M. Baumgartner, ed. Interior west watershed management, procedings of a symposium held April 8, 9, and 10, 1980, Spokane, Washington. Washington State University, Cooperative Extension, Pullman, Washington. (ADF&G, Habitat Library, #R5172.)

__________. 1985. Interactions between streamside vegetation and stream dynamics. Pages 54-58 in Riparian Ecosystems and their management : reconciling conflicting uses, First North American Riparian Conference, April 16-18, 1985, Tucson, Az. Tech. Rpt. RM-120. USDA Forest Service. (ADF&G, Habitat Library, #R5170.)

Huang, Dr. Y.H., and R.K. Gaynor. 1977. Effects of stream channel improvements on downstream floods. July, 1974-December, 1976. Univ. of Kentucky, Wat. Resources Research Inst., Lexington, KY. Res. Rept. No. 102. 76 pp. (ADF&G, Habitat Library, #B6306.)

24 Continued

Lere, M.E. 1982. The long term effectiveness of three types of stream improvement structures installed in Montana stream. M.S. Thesis, Montana State Univ., Bozeman, MT. 99 pp. (ADF&G, Habitat Library, #B3590.)

Leusink, W.A. 1965. Alteration of stream habitat by constructing low elevation gabion dams. M.S. Thesis, Colorado State Univ., Fort Collins, CO. 67 pp. (ADF&G, Habitat Library, #B1841.)

McCall, J.D. ; Knox, R.F. 1979. Riparian habitat in channelization projects. Pages 125-128 in Strategies for protection and management of floodplain wetlands and other riparian ecosystems : proceedings of the symposium, Dec. 11-13, 1978, Callaway Gardens, Georgia. U.S.D.A. Forest Serivce, Washington, D.C. Gen. Tech. Rept. WO-12. (ADF&G, Habitat Library, #R5175.)

Miller, J.G., and R. Tibbott. 1980. Fish habitat improvement for streams. Pennsylvania Fish Comm., Bellefonte, PA. 20 pp. (ADF&G, Habitat Library, #B6034.)

Moreau, J.K. 1981. Gravel entrapment and structural stability of a "v"-shaped gabion weir design in northern California streams. M.S. Thesis, Humboldt State Univ. 125 pp. (ADF&G, Habitat Library, #B1923.)

Moreau, J.K. 1984. Anadromous salmonid habitat enhancement by boulder placement in Hurdygurdy Creek, California. Pages 97-116 in T.J. Hassler, ed. Proceedings : Pacific Northwest Stream Habitat Management Workshop, Oct. 10-12, 1984, Humboldt State University, Arcata, California. (ADF&G, Habitat Library, #R5161.)

Murphy, M.L. ; Koski, K.V. ; Heifetz, J. ; et al. 1984a. Role of large organic debris as winter habitat for juvenile salmonids in Alaska streams. Pages 251-262 in Proceedings of the Western Association of Fish and Wildlife Agencies and the Western Division of American Fisheries Society, Victoria, British Columbia. (ADF&G, Habitat Library, #R5024.)

Newbury, R. W. ; McCulough, G. K. 1984. Shoreline erosion and restabilization in the southern Indian Lake Reservoir. Canadian Journal of Fisheries and Aquatic Sciences. v. 41:558 566. (ADF&G, Habitat Library, #R4263.)

Patterson, D.W. 1976. Evaluation of habitats resulting from stream bank protection projects in Siskiyou and Mendocino counties, California. Pages 53-59 in Cal-Neva Wildlife Transactions. (ADF&G, Habitat Library, #R5155.)

Platts, W. S. 1983. Vegetation requirements for fisheries habitats. Pages 184-188 in Managing intermountain rangelands : improvement of range and wildlife habitats : proceedings of a symposia, Sept. 15-17, 1981, Twin Falls, ID ; June 22-24, 1982, Elko, NV. Gen. Tech. Rep. INT-157. USDA, Forest Service, Intermountain Forest and Range Experiment Station, Ogden, UT. (ADF&G, Habitat Library, #R5181.)

 Continued

Platts, W.S. ; Gebhardt, K.A. ; Jackson, W.L. 1985. The Effects of large storm events on basin-range riparian stream habitats. Pages 30-34 in Riparian ecosystems and their management : reconciling conflicting uses : First North American Riparian Conf., April 16-18, 1985, Tucson, Az., Gen. Tech. Rept. RM-120. USDA Forest Service. (ADF&G, Habitat Library, #R5179.)

Reeves, G.H., and T.D. Roelofs. 1982. Rehabilitating and enhancing stream habitat: 2. field applications. Vol. 13 in W.R. Meehan, tech. ed. Influence of forest and rangeland management on anadromous fish habitat in western North America. USDA: Forest Service Gen. Tech. Rept. PNW-140: Portland, OR. (ADF&G, Habitat Library, #B2439.)

Reichard, N. 1984. Riparian habitat restoration : some techniques for dealing with landowners, livestock, and eroding streambanks. Pages 128-137 in T.J. Hassler, ed. Proceedings : Pacific Northwest Stream Habitat Management Workshop, Oct. 10-12, 1984, Humboldt State University, Arcata, California. (ADF&G, Habitat Library, #R5163.)

Rinne, J.N. 1981. Stream habitat improvement and native southwestern trouts. USDA: Forest Service Res. Note RM-409: Fort Collins, CO. 4 pp. (ADF&G, Habitat Library, #B3825.)

Stroud, R.H. 1971. Stream destruction by channelization. SFI Bulletin. no. 22&1-3. (ADF&G, Habitat Library, #R5187.)

U.S. Army Corps of Engineers. 1963. Symposium on channel stabilization problems. U.S. Army: Corps of Engineers, Vicksburg, Miss. Vol. 1. Tech. Rept. No. 1. 101 pp. (ADF&G, Habitat Library, #B1945.)

__________. 1966. Channel stabilization publications available in Corps of Engineers offices. U.S. Army: Corps of Engineers, Vicksburg, Miss. Tech. Rept. No. 4. 130 pp. (ADF&G, Habitat Library, #B1946.)

__________. 1972. Flat Rock Creek channel improvement (local flood protection project) Tulsa, Oklahoma: final environmental statement. U.S. Army Corps of Engineers, Tulsa Dist., Tulsa, OK. 64 pp. (ADF&G, Habitat Library, #B6294.)

U.S. Department of Transportation. 1979. Restoration of fish habitat in relocated streams. U.S. Dept. of Transportation, Fed. Hwy. Admin., Washington, D.C. Implementation Pkg. 79-3. 63 pp. (ADF&G, Habitat Library, #B3982.)

U.S. Fish and Wildlife Service. 1974. Stream channel alteration guidelines. USDI: Fish and Wildlife Service, Washington, D.C. 23 pp. (ADF&G, Habitat Library, #B1875.)

Wene, G. ; Wickliff, E.L. 1940. Modification of a stream bottom and its effect on the insect fauna. Canadian Entomol. v. 72:131-135. (ADF&G, Habitat Library, #R5154.)

Witten, A. L. ; Bulkley, R. V. 1976. A Study of the effects of stream channelization and bank stabilization on warmwater sport fish in Iowa : subproject 2 : a study of the impact of selected bank stabilization structures on game fish and associated organisms. (ADF&G, Habitat Library, #B6293.)

24-1 Text in these sections has been clarified. The definition for "zero discharge" and "100% recycle" have been added to the glossary.

24-2 Text has been clarified see response 3-2 and Appendix D-1.

24-3 These inconsistencies have been corrected. In addition,the water treatment costs have been revised to reflect a more appropriate sized mine. The average size mine in the FEIS processes 50,000 cubic yards per year versus the 150,000 cubic yards processed in the DEIS.

24-4 The text has been revised accordingly.

24-5 There is no inconsistency between cost estimates presented in the summary and those in Figure 2-6, for Alternatives A, B, and C. (Confusion may have resulted because summary originally contained an error in its discussion of the Proposed Action, where cumulative costs were given as the per mine cost.) Figure 2.6 also represents costs per mine, as indicated in the heading of the left column labeled "1987 (one mine)." Water treatment technology used in the 1987 mining operation is discussed in Section 3.2.2.

24-6 The additions suggested have been made in Chapter One and Two. The BLM has not changed Alternative C to reflect the new EPA effluent guidelines. The fact that EPA has recently selected a slightly different effluent guideline will not significantly change BLM's impact analysis nor will it influence BLM's choice of the Proposed Action. Placer miners will be required to comply with the current effluent guidelines regardless of the guidelines BLM used in evaluating a specific alternative.

24-7 Reference to the Corps of Engineers has been deleted. This section is a summary only; Section 2.3.5 explains the reclamation standards under Alternative C in more detail.

Section 2.3.1, discusses enforcement measures under the subheading "Inspections and Bonding."

24-8 The General Mining Law of 1872 has been included.

24-9 ANILCA Section 402(b) provides that the Secretary may open lands within national conservation areas to entry, location, and patent under the mining laws. It makes no provision for national recreation areas, such as the White Mountains NRA which is the subject of this EIS.

24-10 The requested addition has been made.

24-11 The White Mountains NRA RMP provides for monitoring and evaluation to be accomplished on a three year basis. Generally an RMP has a useful life of about 10 years. By using a 10-year period for evaluation, the various management scenarios can be developed and evaluated. The EIS does not imply that mining will cease after 10 years, but a 10-year period provides a reasonable base to project activities and impacts. This time period also allows for the introduction of new data from monitoring and evaluations.

24-12 See text additions.

24-13 See response 24-6.

24-14 Additional discussion of the roles of EPA and DEC with regards to water quality have been included in Chapters One and Two.

24-15 This statement has been corrected.

24-16 The reference to priority streams has been deleted.

24-17 The State's definition of zero discharge has been inserted in this paragraph in Section 2.3.

24-18 Text revised.

24-19 Text revised.

24-20 The requirements for human and other wastes were removed from Figure 2-5 because they did not change between alternatives.

24-21 A description of BLM's procedures for conducting validity exams can be found in Bureau Manual 3060.

24-22 See Section 2.3.1 and Appendix B-3 for a discussion of BLM enforcement measures.

24-23 See response 24-28 below for further discussion of sediment loads. The majority of the estimated sediment load for the Proposed Action (343 tons/day) is from non-point sources.

24-24 Figure 2-7 is a summary table based on detailed information presented in Chapter Three and Four. Chapters Three and Four have been clarified. Statistics presented in Figure 2-7 have been reviewed and revised.

24-25 These data are not available. Figure 2-7 has been revised.

24-26 See text revision.

24-27 See revision Section 4.11.

24-28 The sediment load figures have been clarified in the Final EIS. The figures in Chapter Three were derived by converting mg/l at a given rate (cubic feet per second) to tons per day. The sediment load for the Proposed Action in Chapter Four was estimated using the methodology described in Appendix E-1. Portions of the Draft EIS concerning sediment load have been revised in the FEIS due to the confusion of several readers.

24-29 The assumptions for determining sediment load are discussed in Appendix E-1. The sediment load was based on acreage disturbed and number of mines, not on water treatment technique (i.e. 100% recycle) or on a performance standard.

24-30 Actually the 273 tons per day (tpd) figures is 17 tpd greater than 256 tpd, not 7 tpd. Figure 2-7 indicates that the sediment load for the past is actually "more than 256" tpd. The 256 tpd figure is not indicative of a non-mining background as suggested because this figure includes 352 acres (.55 square miles) of old mining disturbance.

24-31 The tpd per mine sediment estimates change between 1987 and the Proposed Action because different acres of disturbance are involved in the calculations. The sediment figure for 1987 is based on a disturbance of three acres, while the sediment figure for the Proposed Action is based on a disturbance of 23 acres per mine.

24-32 Figure 2-7 is primarily a summary of impacts discussed in Chapter Four, Environmental Consequences. Figure 4-1 disaggregates the sources of projected sediment loads. The sediment load estimates in Figures 2-7 and 4-1 did not assume "zero discharge" as a performance standard.

24-33 Neither page 4-11 nor Figure 4-1 present any worst case information or analysis on sediment loading. The estimated sediment loading rates do not consider enforcement actions; however, the analysis in Section 4.4 assumes that water quality performance standards are met.

24-34 Information added on State's effort on working with miners, Section 3.2.1..

24-35 Sentence has been revised accordingly.

24-36 Actions common to all alternatives included in 43 CFR 3809 regulations concerning adherence to other applicable rules and regulations.

24-37 Further clarification has been added to the Conclusion subsection of Section 3.6.

24-38 Column heading corrected.

24-39 Citation has been corrected and bibliographic entry added.

24-40 The reference is to the specific game regulations for GMU 25(d) in the Alaska Department of Fish and Game hunting regulations for 1987-1988.

24-41 The qualifier has been changed on Subsistence Maps One and Two. The salmon fishing area has been modified on Map Two.

24-42 Reference changed. The reference to the Subsistence Map Catalog has been deleted from the bibliography.

24-43 Clarification added.

24-44 This paragraph has been revised.

24-45 Comment noted. This section has been extensively revised.

24-46 See text revisions.

24-47 First comment: Actual regrowth rates will vary considerably between sites. The analysis used average figures for regrowth on mine tailings. See Section 3.5.2, "Succession in Mined Areas" for further discussion of the seral stages on old tailings.

Second comment: Text added to the introduction of Sections 4.5 and 4.6.6. Also discussed in Section 4.5.6.

24-48 Further consideration for the potential of mining activities to affect moose population utilized for subsistence in Lower Beaver Creek (Yukon Flats) and additional consultation with the USFWS biologist conducting the work has confirmed the accuracy of Sections 4.6 and 4.9 on this subject.

24-49 The $600 per ounce price of gold is in 1987 dollars and this value was assumed to reach that level sometime within the ten year period analyzed in the EIS. Operating costs would increase with inflation versus fluctuating with the value of gold.

24-50 It has been deleted.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

IN REPLY REFER TO:

NORTHERN ALASKA ECOLOGICAL SERVICES
Room 222, Federal Building, Box 20
101 12th Avenue
Fairbanks, Alaska 99701-6267

June 14, 1988

Richard Dworsky
Bureau of Land Management
701 C Street, Box 13
Anchorage, Alaska 99513

Re: Beaver Creek Placer Mining Draft
Cumulative Environmental Impact Statement

Dear Mr. Dworsky:

The U.S. Fish and Wildlife Service (Service) has reviewed the Draft Environmental Impact Statement (DEIS) on the cumulative impacts of placer mining in the Beaver Creek watershed. The complexity of issues to be dealt with is considerable; in addition to the fact that these activities are occurring within the watershed of a National Wild and Scenic River, they are also within a National Recreation Area and upstream of the Yukon Flats National Wildlife Refuge. The Service maintains considerable interest in placer mining due to its well documented environmental consequences, as well as its implications for resource impacts to downstream Service lands.

The following are general comments on the DEIS, followed by specific comments and recommendations.

GENERAL COMMENTS

The range of viable management alternatives available to the Bureau of Land Management (BLM) are constrained by the legal responsibilities or mandates of BLM and various State and Federal agencies under the existing framework of State and Federal laws and regulations, Federal Executive Orders, and BLM plans for the Beaver Creek watershed. The alternatives consist of specified ranges of performance standards to be applied to placer mining activities. Alternative D (no mining alternative) is discussed but excluded as a viable alternative since it would require changes in Federal laws. It is included to satisfy National Environmental Policy Act (NEPA) and court order requirements.

Overall, the performance standards among the remaining alternatives do not vary substantially, with the exception of Alternative C which is the only alternative offering meaningful standards for mitigation. Consequently, there are only minor variations in predicted environmental consequences among the Proposed Action and Alternatives A and B, which generally provide for the minimal protection to fish and wildlife resources that can be allowed under current laws, regulations and policies.

25-1 Overall, we feel the DEIS needs to offer a broader range of alternatives requiring more than minimal performance standards.

With some exceptions noted later in other comments, the DEIS provides a generalized but reasonably complete overview of fish and wildlife resources occurring within the Beaver Creek drainage and identifies most of the environmental impacts that might result from placer mining activities. However, the cumulative and synergistic impacts of the combined environmental consequences are largely dismissed in the conclusions. In light of existing and anticipated low levels of mining activity in the Beaver Creek watershed, the predicted low levels of impacts may occur, provided that water quality standards and appropriate mitigation are implemented and enforced with greater diligence than in the past.

The DEIS cites the U.S. Army Corps of Engineers (Corps) as a cooperating agency in its development, and assumes the Corps will utilize or "tier" off this document to fulfill their NEPA requirements for environmental assessment during their permitting process. We concur in principle with this goal of consolidating NEPA requirements and thereby reducing duplication of effort by both agencies, particularly in light of overlapping regulatory responsibilities.

25-2 However, aside from stream habitats, the DEIS contains little discussion of the biological values of wetlands subject to Corps' regulation. Instead, the document discusses only general surface impacts. The lack of attention to wetland values is particularly important, since the subject matter of this document (placer mining) is concentrated in streams and stream valleys, which support higher quality wetlands. Discussion of waterfowl, shorebirds, passerines and other wildlife that depend on wetland habitats needs to be expanded. In addition, the alternatives must include specific standards for protecting or mitigating wetland values lost from placer mining activities. To satisfy the Corps' responsibilities for cumulative impact assessment under NEPA and Section 404(b)(1) of the Clean Water Act, the document must focus more attention on wetland resources, cumulative effects, and mitigation of lost wetland habitat values.

25-3 The Proposed Action allows for water quality variances without defining what such variances mean. We presume these would permit exceedence of Federal and State criteria. However, we are not sure that inclusion of variances in alternatives under consideration is

25 Continued

appropriate at this stage. As mentioned in the DEIS, effluent guidelines and water quality standards fall under the regulatory auspices of the Environmental Protection Agency (EPA) and Alaska Department of Environmental Conservation (ADEC) and are established in accordance with the Clean Water Act. It should be clearly stated that water quality criteria established by the EPA for drinking water, the protection of freshwater aquatic life, and other use categories apply nationwide, and that they apply in the natural receiving waters at the end of the pipe, not 500 feet downstream. The State may adopt stricter, but not more lenient standards. The State has, as an operating procedure, measured water quality parameters 500 feet downstream. Legally, however, the miner must meet State water quality standards anywhere in the stream unless a variance for a mixing zone is granted for a specific parameter and project. Variances are only granted based on a demonstration that there will be no excursion of water quality standards during low flows in the receiving stream. Currently, the EPA has only granted variances for one NPDES placer mining permit parameter (turbidity). **25-3 cont'd**

In the Beaver Creek drainage, the State and EPA must also consider EPA's Antidegradation Policy, as defined under their current regulatory program (48 FR 51400, 40 CFR § 131.12). This policy requires that water quality in high-quality waters constituting an outstanding National resource (e.g., Beaver Creek) be "maintained and protected." The water quality standards included in the Proposed Action do not appear to be compatible with current regulations or with the Antidegradation Policy. **25-4**

Although BLM cannot sanction or select more or less stringent water quality standards (or points of measurement), or determine whether or not variances will or will not be allowed in various alternatives, BLM can influence conformance to water quality requirements by selecting a range of surface management and reclamation techniques.

Although the DEIS does not clearly explain the rationale for selection of the Proposed Action over the various alternatives, it does imply that additional reclamation and higher water quality standards required by alternatives other than the Proposed Action would be an economic burden on miners. The minimal reclamation requirements of the Proposed Action may not satisfy applicable legal requirements and management priorities for the area that are established by the Alaska National Interest Lands Conservation Act (ANILCA), the White Mountains National Recreation Area Resource Management Plan, and the Beaver Creek Wild River Management Plan. Some of the reclamation provisions found in Alternative C should also be considered. Mined and/or diverted stream channels should be reconstructed to reestablish grades and configurations that approximate or enhance natural conditions. This reclamation provision is necessary to facilitate or expedite restoration of lost fish habitat values and we recommend that it be a standard

reclamation requirement. Such reclamation is important, and should not be an excessive burden to miners. In any event, stream channel restoration is already included in most mining plans submitted to regulatory agencies.

Alternative C, the most comprehensive of the four alternatives, includes other performance standards that, when considered cumulatively, appear to be an unnecessary burden on placer miners. The 0 ml/l and 0 NTU water quality limitation would certainly be desirable, but may not be feasible in all cases. Establishment of such effluent limitations are the responsibility of agencies other than BLM. The requirement to rebuild stream channels with pools, riffles, and other natural features, also desirable, would normally not be necessary. If stream reclamation provided for appropriate gradients and configurations, natural equilibria would result in development of pools and riffles. Reseeding native species should not be necessary in most cases, although fertilization may be warranted in situations where rapid revegetation is necessary. Respreading fines from settling ponds over mine tailings may not always be necessary, and may be undesirable if such fines contain high levels of metals and/or arsenic. The effect of combining basic reclamation requirements with less practical reclamation steps in one alternative is to make that alternative appear unreasonable. As a result, the fundamental and practical reclamation steps included in this provision become infeasible by association. Therefore, we urge you to consider the development of additional alternatives or inclusion of such basic reclamation requirements in the Proposed Action.

25-5 A final point to consider is that placer mining occurs extensively in watersheds adjacent to that of Beaver Creek. A cumulative impact assessment of placer mining should include a discussion of the combined effects of mining in adjacent drainages. Consideration of regional impacts on wildlife populations is appropriate for wide-ranging animals whose normal ranges extend across multiple watersheds and whose habitat requisites or preferences include riparian habitats subject to placer mining impacts.

SPECIFIC COMMENTS

25-6 <u>Page 1-7, Figure 1-2:</u> Section 401 of the Clean Water Act is administered by the State of Alaska (ADEC), under Federal guidelines. EPA is responsible for Section 402 of the Act.

25-7 <u>Page 2-1, paragraph 3:</u> We cannot find the referenced summary of public scoping comments that are supposed to be provided in Chapter 5.

25-8 <u>Page 1-2, paragraph 6 and Page 1-8, last paragraph:</u> As discussed in our general comments, this document should focus more attention on wetland resource values, impacts and mitigation if it is intended to jointly satisfy NEPA and Clean Water Act requirements.

Page 2-2, paragraph 2: The last sentence says that customary and prudent placer mining operations are "undue and unnecessary", which we doubt was your intent. 25-9

Page 2-7, last paragraph: The last sentence indicates that all Federal mining claims meet the EPA/ADEC standards of 0.2 ml/l settleable solids and 5 NTU of turbidity, with no variances. This statement may be true if it applies to the single active mine that operated in the Beaver Creek watershed in 1987, for which BLM required a zero discharge water treatment system. However, this statement is incorrect if it applies to Federal claims in general. Many mining operations on Federal claims do not meet turbidity standards.

Page 2-16, paragraph 4: The significance of placer mining impacts on fishery resources is greatly understated, unless BLM intends to require and diligently enforce mitigation measures that go well beyond the minimal performance standards to be required by the preferred (status quo) alternative. It is stated that direct effects on fish habitat could be alleviated through adherence to performance standards and use of mitigation measures, but the Proposed Action seems to require no additional protection beyond current requirements. The severe impacts of placer mining on fish and fish habitat values have been well documented on Birch Creek both within and well downstream of "status quo" mining operations. In Beaver Creek, if placer mining activities are sustained at current low levels, impacts on fishery resources may not be significant. However, should the level of mining activity increase, fishery resource impacts will probably substantially increase. Any data on solids, turbidity or metal levels downstream of the existing Beaver Creek mine would be useful in assessing potential impacts, and should be presented if available to assess current impacts.

The same paragraph indicates that unavoidable adverse impacts from sediments are short-term and would cease upon cessation of the mining operations and completion of reclamation. This statement belies the fact that mining operations rarely "cease"; they progressively continue (usually upstream). Mining operations in the area are not expected to cease, but continue into the foreseeable future; thus impacts will continue accordingly. In addition, high metals levels and turbidity may be perpetuated by non-source point erosion at the old mine sites resulting in further long-term effects.

Pages 2-22 and 2-23: The summary of environmental consequences for Alternative D (no future mining) discusses the unavoidable loss of 346 acres of vegetation cover and approximately 300 to 320 acres of winter moose range due to past mining. However, for the Proposed Action and other alternatives, the document focuses on the additional acreages of vegetation cover and winter moose habitat expected to be lost from future mining. 25-10

25-10 cont'd Habitat "losses" discussed in the no mining alternative are identified as "physical alterations" in other alternatives. Thus, the wording and acreage computations tend to distort the significance of additional long-term destruction of wildlife habitat and actually tend to imply that less wildlife habitat will be lost by allowing additional mining. Acreages of long-term habitat losses from previous mining should be consistently incorporated into the environmental consequences for all alternatives.

25-11 Pages 2-24, 2-25; Figure 2-7: Under "Water Resources," the natural or baseline sediment loads seem to be high for a clearwater stream such as Beaver Creek.

25-12 In addition, a "no significant impact" conclusion for toxic substances is made for all alternatives. It is not clear whether this refers solely to contaminants such as fuel oils and industrial chemicals, or is intended to include elevated levels of naturally-occurring heavy metals generated by erosion and/or effluent discharges. According to EPA (and traditional) definitions, heavy metals and metalloids such as arsenic are toxic substances at certain elevated levels. There is considerable information on acute and chronic effects of many metals on plants, invertebrates, fish and humans in EPA's water quality criteria series as well as in other sources. This literature should be reviewed for metals that may be released in elevated levels by placer mining. The metals of interest in the Beaver Creek area are mercury, arsenic, selenium, and other metals shown as deposits in the basin by USGS mineral resource maps. Elevated levels of various metals, sometimes exceeding EPA standards for drinking water and aquatic life protection, have been well documented downstream of placer mining activities in most mining areas. Effects cited in the EPA criteria documents for such elevated levels should be described, and quantitative projections of actual metals and solids levels for Beaver Creek should be made before concluding that effects will be biologically insignificant. Service data collected downstream within the Yukon Flats National Wildlife Refuge (Attachment C) indicate elevated selenium levels in fish tissues and above-average mercury levels in sediment samples collected from Beaver Creek. In light of what is known about the effects of placer mining on toxic metal levels, a conclusion of no significant impact from toxic substances seems difficult to support for all alternatives, except Alternative C, which requires zero discharge standards, and Alternative D (no mining).

Only short-term impacts on fish populations are predicted for the Proposed Action and Alternatives A and B. Unless this is viewed in the context of geologic time, we disagree with the conclusion that only short-term impacts will occur, particularly when existing studies and data documenting fishery impacts resulting from placer mining reflect conditions which would be perpetuated by the Proposed Action. This proposal includes allowable variances to existing

water quality standards and thus allows some level of water quality degradation to affected streams which would likely reduce stream productivity for at least as long as mining occurs. In addition, the above-mentioned alternatives do not provide for reclamation of diverted and mined stream sections, but allow stream diversions to be retained as permanent stream channels upon completion of mining. Therefore, habitat values and fish productivity will be adversely affected over the long term.

Page 2-26, Figure 2-8: Again, if toxic substances include heavy metals, impacts from toxic substances under the "Worst Case Scenario" will probably be significant.

Page 3-1, paragraph 2: The three required elements referenced to Section 1.7 are not mentioned in that section. **25-13**

Page 3-1, last paragraph: The claim that "some mining practices tend to enhance erosion processes" (emphasis added) is a little misleading. It should read "Past mining practices have created serious erosion problems." It should not be inferred that such activities are nothing more than extensions of "natural processes".

Page 3-14, paragraph 3: The statement is made that "...arsenic and mercury are effectively reduced to non-hazardous levels with simple settling of mine effluent..." If this is the case, the sediments that settle out in the settling ponds must be contaminated with high levels of these and other metals. The ultimate fate of these contaminated sediments is not addressed in this document. Settling ponds must be cleaned periodically, they are subject to flooding and breaching, and are usually capped upon completion of mining. We recommend that settling pond sediments be sampled periodically during mining and prior to abandonment to assure that excessively contaminated sediments are identified for possible further corrective action.

Page 3-24, last paragraph: The reader is referred to Section 3.4.1, which does not even mention heavy metals. This is a serious omission, since heavy metals are an important issue. **25-14**

Metals data were requested from this office by BLM and were provided to your agency. Metals data from Beaver Creek were collected in 1986 and are provided for your information in Attachment A (water samples), Attachment B (arctic grayling whole carcasses) and Attachment C (grayling liver and kidneys). All sampling within Beaver Creek for metals analysis was accomplished either within or near the Yukon Flats National Wildlife Refuge, well downstream of the mined tributaries.

In addition to the attached metals data on water and fish tissues, sediments sampled at the refuge boundary in 1986 contained levels of arsenic (12 mg/kg dry wt.) and manganese (868 mg/kg dry wt.) which are elevated above National averages. Similar sampling was conducted in 1987, but the analytical results have not yet been received by this office. Feel free to contact this office for such data.

25-15 Page 3-27, paragraph 4: Dwarf birch is not an ericaceous shrub.

25-16 Page 3-28, Figure 3-3: Under forest communities, spruce-birch and aspen-spruce are successional, not riparian.

25-17 Page 3-30, paragraph 2: This subsection on wetlands should discuss the values of wetlands relative to the Beaver Creek watershed. Instead, it is devoted almost entirely to analyzing the Corps' regulatory definition of wetlands, with virtually no mention of their physical and biological values in the watershed. The value of wetlands to fish and wildlife resources, water quality, and local hydrology should be discussed.

25-18 Page 3-31, first 2 paragraphs: The following plant genera are misspelled: Calamagrostis, Stereocaulon, Hylocomnium, and Peltigera.

25-19 Page 3-31, paragraph 4: This description of vegetation recovery is based on extrapolation from naturally disturbed areas, not mined areas as implied. Since there are no examples of 200-300 year old mines, we cannot be at all sure that recovery will proceed in this manner.

25-20 Page 3-33, Section 3.5.4: The definition of endemic species is not "those considered vulnerable because of a significant...reduction of population, numbers or habitat." Endemic species are those native to the area and found nowhere else. Thus, Poa porsildii is not endemic to the Beaver Creek watershed. It also cannot possibly live "on or under persisting snowbeds."

25-21 Page 3-36, paragraph 3: Based on the figures provided here, only 10-16% (30-50 acres) of the 310 acres of previously mined habitat has recovered over the last 40-50 years to a "usable" browse stage for moose. The document indicates elsewhere that 40-50 years are all that is needed for a tall shrub community to develop, implying complete recovery to a productive and presumably "usable" shrub community. How long will it take to return to a largely "usable" condition (e.g., more than 50%)? We presume the more optimistic recovery rates used to assess future environmental consequences are based on implementation of improved reclamation requirements which may enhance browse production. Nevertheless, browse usability should be factored into any discussion of the time required for such communities to become "productive".

Page 4-9, last paragraph: We disagree with the conclusion that mining will not significantly change chemical water quality components such as heavy metals. Studies on placer mining impacts, including some referenced in this document, indicate otherwise. The only possible basis for this conclusion would be a low expectation of mining activity in this area. 25-22

Pages 4-16, 4-18: The regrowth scenario described here appears inconsistent with Figure 4-3. Since the remined tailings lack fine materials (percent fines not indicated), Figure 4-3 indicates that regrowth to a stable, sustaining, productive community of shrubs may take more than 50 years. 25-23

Page 4-23, paragraph 1: Candidate plant species are those being considered by the Fish and Wildlife Service for listing, not "endemic" species. 25-24

Page 4-33, paragraph 1: In discussing the no mining alternative, the document states that 300-320 acres of riparian habitat will remain "lost" due to past mining activities. However, in previous statements made about the Proposed Action (e.g., page 4-27), the same lands are referred to as "physically altered". This wording tends to bias the comparison of alternatives. 25-25

Page 4-39, paragraphs 1 & 2 and page 4-41, last paragraph: The document abruptly declares the potential biological significance of elevated heavy metal concentrations to be "unknown" and the following discussion of the effects on fish populations says nothing more about this subject. Literature is available, including references cited in the DEIS, concerning adverse impacts of heavy metal pollutants. The biological significance of increased heavy metal concentrations constitutes a very important issue that should not be neglected in assessing the cumulative impacts of placer mining. 25-26

Page 4-51, paragraph 3: The document appropriately acknowledges that sedimentation would limit fish spawning immediately downstream from mining activities, but concludes that such impacts are insignificant, since spawning would simply be pushed further downstream. Since subsistence fishing occurs further downstream anyway, it "should not be notably affected as fish would still be present." This reasoning ignores the relative extent, quality and use of downstream spawning habitat and other problems associated with sedimentation (e.g., turbidity, reduced productivity, lowered invertebrate diversity, dissolved oxygen changes, elevated metal concentrations, etc.). It also ignores any contribution to downstream fish populations from fish spawned and/or reared upstream. 25-27

SUMMARY AND RECOMMENDATIONS

In summary, while the DEIS appears complete, it is far from comprehensive, and tends to downplay or ignore impacts and alternatives which might make the Proposed Action seem less appealing. We believe that this approach has the effect of limiting alternatives, and thus contravenes the intent of NEPA. Furthermore, the document is seriously deficient in its analysis of the ultimate consequences of allowing the continuation of placer mining in each of the alternatives other than "D". Although such impacts may not be unacceptable under the scenario described, there remains the possibility of a "worst case" situation involving more mining operations and significantly greater impacts.

We are also concerned that the superficial treatment of impacts to wildlife, fisheries, and water quality may be repeated in future documents (i.e., Birch Creek, Fortymile River, and Minto Flats), where the nature of these impacts would remain the same, but the scale of habitat losses and population reductions would increase significantly. Furthermore, if this document is to become a model for future impact assessment by the Corps of Engineers in their permitting process, the description of wetlands and analysis of the consequences of their loss to the physical and biological attributes of this system must be addressed in greater detail.

We recommend that Chapters III and IV (Affected Environment and Environmental Consequences) be substantially revised to more fully incorporate existing information on the effects of placer mining on aquatic and terrestrial habitats and populations. The revised analysis should at a minimum include:

25-28

1. A summary of available data on heavy metals levels in Beaver Creek and other streams in the region.

25-29

2. An analysis of the physical and biological fate of these metals; where there are insufficient data for this area, studies of analogous systems and species should be cited as indicators of potential problems.

25-30

3. The ultimate population-level effects to fish and wildlife species projected to occur due to losses of spawning habitat, winter range, etc. (i.e., quantify such statements as "reduction in the long-term opportunity for increasing the potential moose population"). Where possible, these should be based on the best available population estimates for the area.

4. Consideration of other wildlife species with specific preferences or requirements for riparian habitat destroyed by placer mining (e.g., shorebirds, waterfowl, passerines) in assessing habitat losses and potential population declines.

5. Discussion of the potential cumulative effects of placer mining on populations of wide-ranging species utilizing more than one drainage (e.g., moose populations in Beaver Creek plus Birch Creek; or caribou population(s) common to Beaver Creek, Birch Creek, and the Fortymile River).

6. Description of the physical and biological attributes of wetlands adjacent to streams, their species assemblages, and the impacts of their loss, both individually and cumulatively. 25-31

We further recommend that there be some reorganization of alternatives such that the range of options, particularly for reclamation, is broader and more realistic. In addition, each alternative to the Proposed Action should address mitigation of cumulative effects on habitats, since this is what the document is supposed to be analyzing. There are few alternatives to existing land and water use practices available to placer miners. Therefore, the only feasible mitigation strategy for habitat loss is one of rectification (reclamation). Since reclamation cannot regain more than a portion of lost habitat value, what other steps can be taken to reduce net losses? The only other possibility is to limit the number of mines operating in a given area by establishing a threshold for combined impacts to terrestrial and/or aquatic systems. While we recognize the regulatory constraints (as for Alternative D) on this option, it is the only other way that cumulative effects can be limited. Thus, it is important to explore its potential as an alternative. 25-32

Based on your present analysis, we would either recommend selection of Alternative C, or incorporation of its more important reclamation elements into the Proposed Action to make the latter more acceptable. Provisions for creation of surface conditions which promote more rapid surface rehabilitation, and the restoration of stream gradients and configurations are critical elements in re-establishing lost habitat values.

We appreciate the opportunity to comment on the Beaver Creek DEIS, and look forward to development of a sound Final Cumulative Environmental Impact Statement. If you have any questions concerning these comments, we encourage you to contact this office.

Sincerely,

Paul E. Gertler

Paul E. Gertler
Field Supervisor

25 Continued

Attachments

cc: Regional Director, NPS, Anchorage
Ron Morris, NMFS, Anchorage
Rich Sumner, EPA, Anchorage
Ray R. Emerson, MMS, Anchorage
Patti Wightman, DGC, Fairbanks
Al Ott, ADF&G, Fairbanks
Pete McGee, ADEC, Fairbanks
Judd Peterson, ADNR, Fairbanks
WAES, FWS, Anchorage
SEES, FWS, Juneau
Yukon Flats, NWR, Fairbanks

ATTACHMENT A

Metals Concentration (mg/1) in Water Samples (n=2)
From Beaver Creek - 1986

	Total Metals	Dissolved Metals
As	ND[1]	ND
Cd	ND	ND
Cu	ND	.0097[2]
Fe	.209	.0990[3]
Mo	ND	.0004[2]
Ni	.003	.0038
Pb	ND	.008
Se	ND	ND
Tl	ND	ND
V	ND	ND
Zn	.0058	.012

[1]Not detectable
[2]Filtered sample possibly contaminated by filter.
[3]Elevated with almost half in dissolved form, but not critical.

Note: Samples also collected and analyzed for Hg. However, prescribed holding time for Hg was exceeded, so results not reliable and thus not reported.

ATTACHMENT C

Metal Concentration in Arctic Grayling Liver & Kidney Tissue
Beaver Creek, 1986

	Grayling - Liver					Kidney				
Fish ID	1L	2L	3L	4L	5L	1L	2L	3L	4L	5L
Hg	.19	.13	.13	.22	.14	.28	.30	.23	.49	.24
As	ND	ND	ND	ND	ND					
Cd	.52	.39	.27	.41	.28					
Cu	4.09	2.81	1.57	6.53	4.0					
Fe	87.2	68.4	61.2	70.2	63.5					
Mo	.11	.095	.086	.131	.07					
Ni	.05	.05	.52	.40	ND					
Pb	ND	ND	ND	ND	ND					
Se*	2.0	2.2	1.4	2.5	3.7					
Tl	ND	ND	ND	ND	ND					
V	.046	.034	.02	.061	ND					
Zn	16.5	18.6	16.9	21.6	17.7					

*Elevated

25 Continued

ATTACHMENT B

Metals Concentration (mg/kg wet wt.) in Arctic Grayling Carcasses
Collected from Beaver Creek - 1986

	mg/kg wet wt.				
Fish ID	1WB	2WB	3WB	4WB	5WB
Hg	.134	.013	.061	.12	.12
As	ND	ND	ND	ND	ND
Cd	.013	.012	.01	.007	.016
Cu	.40	.36	.30	.38	.38
Fe	20.7	15.3	25.5	24.0	20.4
Mo	ND	ND	ND	ND	ND
Ni	.16	.04	.07	.103	.05
Pb	ND	ND	ND	ND	ND
Se*	.52	.44	.49	.76	.67
Tl	ND	ND	ND	ND	ND
V	.02	.014	.01	.013	.011
Zn	15.7	21.4	18.1	20.7	14.3

*Selenium slightly elevated above National averages; all other levels normal or below normal.

IN REPLY REFER TO:

United States Department of the Interior

FISH AND WILDLIFE SERVICE
NORTHERN ALASKA ECOLOGICAL SERVICES
Room 232, Federal Building, Box 20
101 Twelfth Avenue
Fairbanks, Alaska 99701-6267

TAKE PRIDE IN AMERICA

July 12, 1988

Richard Dworsky
Bureau of Land Management
701 C Street, Box 13
Anchorage, Alaska 99513

Re: Beaver Creek data

Dear Mr. Dworsky:

The U.S. Fish and Wildlife Service recently submitted data for fish metals levels and water metals levels in Beaver Creek. These data were submitted with our review of the Beaver Creek Cumulative Environmental Impact Statement. We have recently discovered that the metal residue values of the fish were computed incorrectly from the dry weight values. Please substitute the corrected attachments for the original data on fish. The corrections are minor; however, we nevertheless wish to amend our original data sent. The data on metal levels in water originally submitted were correct and can be retained.

Sincerely,

Elaine Snyder-Conn

Elaine Snyder-Conn
Environmental Contaminats Specialist

Attachments

25 Continued

ATTACHMENT B

Metals Concentration (mg/kg wet wt.) in Arctic Grayling Carcasses
Collected from Beaver Creek - 1986

mg/kg wet wt.

Fish ID	1WB	2WB	3WB	4WB	5WB
Hg	.181	.128	.085	.162	.111
As	ND	ND	ND	ND	ND
Cd	.018	0.016	.014	.010	.020
Cu	.546	.504	.427	.510	.501
Fe	28.08	21.25	35.62	32.13	26.44
Mo	.010	ND	ND	ND	ND
Ni	.221	.056	.114	.137	.068
Pb	ND	ND	ND	ND	ND
Se*	.702	.616	.741	1.02	.866
Tl	ND	ND	ND	ND	ND
V	.026	.019	0.014	.017	.013
Zn	21.32	29.68	25.42	27.79	18.51

*Selenium slightly elevated above National averages; all other levels normal or below normal.

ATTACHMENT C

Metal Concentration in Arctic Grayling Liver & Kidney Tissue
Beaver Creek, 1986

	Grayling - Liver					Kidney				
Fish ID	1L	2L	3L	4L	5L	1L	2L	3L	4L	5L
Hg	.237	.165	.169	.284	.177	.034	.394	.320	.615	.306
As	ND	ND	ND	ND	ND					
Cd	.67	.50	.35	.54	.36					
Cu	5.22	3.60	2.05	8.60	5.20					
Fe	111.46	87.88	80.24	92.4	82.4					
Mo	.14	.12	.66	.17	.09					
Ni	.06	.02	.68	.52	.16					
Pb	ND	ND	ND	ND	ND					
Se*	2.59	2.82	1.89	3.32	4.77					
Tl	ND	ND	ND	ND	ND					
V	.06	.04	.02	.08	ND					
Zn	21.1	23.9	22.1	28.4	22.9					

*Elevated

25-1 See response 21-2.

25-2 Text revised, Sections 3.5 and 4.5.

25-3 A discussion of EPA variances has been added to the text (Section 2.3.2). Text has also been corrected to delete references to mixing zones.

25-4 It is BLM's policy to support EPA and the State of Alaska in their efforts to maintain high water quality. None of the alternatives, including the Proposed Action, violates the antidegradation policy identified in 40 CFR 131.12 or the Clean Water Act of 1972, as amended.

25-5 The court injunction required evaluation of the Beaver Creek watershed.

25-6 Figure 1-2 has been revised.

25-7 Referenced text is Section 1.5. Text corrected.

25-8 Sections 1.2 and 1.9 revised per Corps' request. Further additions pertaining to wetlands provided by the Corps have been incorporated throughout the document, especially in Sections 3.5, 4.5, and Appendix F.

25-9 Text revised.

25-10 Summary has been revised.

25-11 Additions have been made to Section 4.4 concerning the data base available from previous sedimentation research in Alaskan streams.

25-12 See addition to Section 4.4 and response 20-6.

25-13 Text corrected to Section 1.8.

25-14 Reference has been corrected; please see Section 4.4.

25-15 Text clarified.

25-16 Spruce and birch are often found in riparian zones in Interior Alaska rivers. Aspen/spruce is not meant to be indicated as riparian.

25-17 Text expanded, Section 3.5.

25-18 Text corrected.

25-19 The description used for analysis is based on studies of old mined tailings which show similar patterns, if slower rates of revegetation. It is reasonable to assume that climax riparian spruce on mined areas will take at least as long as regrowth after wildfires.

25-20 Text has been corrected.

25-21 There are two components to the calculation of regrowth of shrub communities, temporal and spatial. Temporal projections are derived from the data shown in Figure 4-3, the time anticipated for an area to regrow to a tall shrub community. The spatial component is the percentage of the disturbed area which will remain barren or sparsely vegetated for a long period of time, generally greater than 50 years. This percentage varies according to mining techniques used and amount of fine-grained materials in the near surface layer of tailings. These figures are given in Appendix D-1, and were used to calculate the model for barren and sparsely vegetated acreage listed in Figure 4-2.

Clarification of criteria for vegetative conditions are a part of Section 3.5 and were the basis for characterizing or describing browse.

25-22 See response 20-6 and additions to Section 4.4.

25-23 See response 25-21.

25-24 Text corrected.

25-25 Text has been revised Section 4.6.5.

25-26 See response 20-6 and additions to Section 4.4.

25-27 The analysis in Section 4.7.1 states that direct effects of mining would be habitat degradation due to physical alteration and blockage of fish migration. "Clear water tributaries and other areas in the basin will continue to support all age classes and sizes, including fry, of grayling and other species. The overall magnitude of adverse effect to fish populations is not possible to determine based on this information; it was judged that potential impact to fishery resources are unlikely to be felt in those villages to any significant extent.

25-28 Section 4.4 has been revised to discuss available data. Also see response 20-6.

25-29 See revisions to Section 4.4.

25-30 Lack of quantitative data concerning populations and effects of mining on populations precludes quantitative analysis (modeling) in this context. The qualitative statement in the EIS is intended to provide a relative framework for comparison of the alternatives only.

25-31 See additions to Section 3.5 and 4.5 as analyzed by the Corps.

25-32 Section 4.12 Mitigation has been revised.

Citizens' Advisory Commission
on Federal Areas

515 Seventh Avenue
Suite 310
Fairbanks, Alaska 99701
(907) 456-2012

June 20, 1988

Mr. Michael Penfold
State Director
Bureau of Land Management
701 C Street, Box 13
Anchorage, Alaska 99513

Dear ~~Mr. Penfold~~ Mike:

The Citizens' Advisory Commission on Federal Areas has completed its review of the Beaver Creek Placer Mining Draft Cumulative Environmental Impact Statement (DCEIS). We offer the following comments for your consideration.

The Commission appreciates the extraordinary effort the Bureau of Land Management (BLM) has demonstrated in preparing the DCEIS under severe time constraints without sacrificing public involvement. We find the DCEIS to be generally accurate, well organized and thorough. Furthermore, we believe the Bureau has selected a proposed action which affords placer miners a reasonable opportunity to operate while ensuring that appropriate measures are taken to protect the resources of the Beaver Creek drainage. The Commission supports the Bureau's proposed action.

26-1 The proposed action would require that miners obtain and comply with permits from other federal and state resource managing agencies. This would include the strict water quality standards imposed by the Alaska Department of Environmental Conservation (ADEC) and the Environmental Protection Agency (EPA). The cumulative authority of the BLM and all other agencies involved in monitoring and regulating placer mining on Beaver Creek is sufficient to provide an appropriate level of protection for resources while maintaining opportunities for other uses. Although few other uses are occurring in the Beaver Creek drainage presently, the proposed action would allow a continuation of placer mining at a projected level which would not preclude an expansion of other uses.

An important concern which has been a major focus of debate regarding placer mining in Alaska is the impact on subsistence resources and their uses. As foreseen by the DCEIS on page 2-16, the low level of placer mining activity in the Beaver Creek drainage will not have any impact on subsistence uses which are rare to non-existent. Access facilitated by a continuation of placer mining activity that the DEIS forecasts may lead to a slight increase in the present low level of recreational activities in the upper reaches of the Beaver Creek drainage. Because there is no documented use of the area by subsistence users now or in the past, there would be no impacts on subsistence arising from the projected increase in recreational use. Additionally, although potential enhanced access is noted in the discussion of the proposed action in the description of alternatives on page 2-16, this should also be mentioned in the summary on page S-4.

Also on page S-4 of the Summary, the DCEIS indicates that "reclamation at the end of mine life would be undertaken on all disturbed lands which remain. This acreage would be an irretrievable and irreversible loss of vegetation resources." This is contradictory to the statement on page 4-9 in the Environmental Consequences chapter: 26-2

> "There would be no irreversible or irretrievable commitment of soil resources under the Proposed Action and Alternatives A,B, and C since productive soil stability will eventually develop after 50 years if reclamation practices are followed."

It is evident that the level of use of the Beaver Creek drainage by miners and other users is relatively low. Hence, there is a much lower potential for conflict between user groups than is the case on Birch Creek. The Commission believes that the Bureau of Land Management has taken a reasonably balanced approach to the uses of resources in the Beaver Creek drainage. It is our hope that the BLM's proposal will succeed in gaining the confidence of the public and obviate the need for future legal actions.

Sincerely,

Stan Leaphart

Stan Leaphart
Executive Director

26-1 Regardless of the alternative selected, compliance with other federal and State permitting regulations is required (43 CFR 3809.2-2).

26-2 See text corrections in the Summary and Section 4.3.

6/17/88

Mr. Dworsky:

I am submitting my comments regarding the Beaver Creek and Birch Creek Environmental Impacts Statements. First of all, ~~I~~ let me make it clear that I think it's an outrage that people such as miners can enter public lands and waterways that belong to all Americans and poison and pollute these areas for their own personal profit. It should be considered a priviledge for these people to ~~[illegible]~~ enter these water ways. If they cannot clean up their messes without fouling up the natural environment then I suggest they find another occupation. ~~In~~ many countries such as some places in Central and South America where there is no environmental control total watersheds are being destroyed in the search for gold and other minerals. This happened in our nation about 100 years

ago. We have since learned that by destroying our land and water we destroy ourselves. Alaska is one of the few places left in America where natural waterways have not been damaged by man's influence. I suggest that we preserve the little we have left. The private gains made by the miners hardly makes up for the losses suffered by the rest of the public, not to mention the living things that inhabit these streams and rivers.

I would like submit the following comments:

1. Recreation and conservation should be given top priority over mining in the White Mountains National Recreation Area and the Steese National Conservation Area and the National Wild Rivers Within them. These areas were clearly established for recreation & conservation

2. Full reclamation and water quality control measures should be implemented. Acquatic life that supports higher levels of the food chain (such as fish) would be drastically affected if short cuts in these areas are taken. The stream's life support system should not be compromised.

3. I endorse reclamation practices defined under Alternative C even though much damage is still likely to occur.

4. These two National Wild Rivers must be protected for our Children's children's children. Water quality should meet or exceed all state and federal water quality standards. Some mines have demonstrated the ability to meet these standards so it can be done.

5. Unless these ~~[illegible]~~ special areas

27 Continued

in the Steese/White Mountains are fully protected as they were meant to be I would support the "no mining" alternative instead of alternative C. We owe it to future generations to be good stewards of this great land.

Thank you for accepting my comments.

Sincerely,

Mark Fusch

Sunrise, Mt. McKinley Ansel Adams

SIERRA CLUB LEGAL DEFENSE FUND, INC.

419 6th Street, Suite 321 Juneau, Alaska 99801 (907) 586-2751

ALASKA OFFICE

Lauri J. Adams
Philip S. Barnett
Staff Attorneys

Other Offices

SAN FRANCISCO OFFICE

2044 Fillmore St.
San Francisco, CA 94115
(415) 567-6100

ROCKY MOUNTAIN OFFICE

1600 Broadway St.
Suite 1600
Denver, CO 80202
(303) 863-9898

WASHINGTON, D.C. OFFICE

1516 P Street, N.W.
Suite 300
Washington, DC 20005
(202) 667-4500

June 20, 1988

Mr. Richard Dworsky
Bureau of Land Management
701 C Street, Box 13
Anchorage, Alaska 99513

Re: Comments on Draft Beaver Creek EIS

Dear Mr. Dworsky:

The following comments on the draft Beaver Creek EIS are submitted on behalf of the Sierra Club, The Wilderness Society, the Northern Alaska Environmental Center, the Birch Creek Village Council, and the Minto Village Council. They are intended to supplement whatever specific comments these groups submit in their individual capacities.

In sum, the draft EIS is a worthwhile document that makes some progress towards addressing the serious cumulative impacts of placer mining on Beaver Creek National Wild River. Nevertheless, there are a number of significant shortcomings in the EIS, which will be described at length below. BLM should revise and reissue the draft for public comment.

I. *BLM Must Examine a Wider Range of Alternatives*

Under NEPA, the consideration of alternatives is "the heart" of an environmental impact statement. 40 C.F.R. § 1502.14. So important is their consideration, in fact, that "the existence of a viable but unexamined alternative renders an environmental impact statement inadequate." *Citizens for a Better Henderson v. Hodel*, 768 F.2d 1051, 1057 (9th Cir. 1985). Nonetheless, the EIS violates this fundamental rule. 28-1

The basic problem is that all the EIS evaluates are different "performance standards." It is certainly proper for BLM to consider differences in such standards, and BLM is to be commended for including in its alternatives an array of different water quality standards and reclamation requirements. But performance standards are by no means the whole solution.

28-2 Specifically, BLM should also consider alternatives that set maximum pollution and maximum disturbance levels for the Beaver Creek system as a whole -- and for each tributary system individually. Such an approach would provide that BLM would not allow, say, sediment loads from mining in the system to exceed a fixed number of tons per year. Under this system, which would serve as a supplement to the protection achieved through imposition of performance standards, BLM would in effect place a "bubble" over the region. Once pollution or terrestrial or aquatic disturbance levels reached the ceilings identified by BLM, new mines could not start operating unless existing mines achieved offsetting reductions. Of course, although BLM should evaluate a range of possible ceilings, BLM should ultimately select highly protective ones, given the congressionally recognized "outstandingly remarkable" values of Beaver Creek. *See* 16 U.S.C. § 1271.

There are several advantages to evaluating these sorts of "quantitative" alternatives. For one thing, they would require BLM to confront perhaps the most central cumulative-impacts issue -- namely, how much impact is appropriate for the Beaver Creek system collectively (and its tributary streams individually), as measured in concrete terms like tons of sediment pollution or acres of unreclaimed land or linear feet of disrupted spawning habitat.

For another, if BLM implemented such an approach, BLM would be able to ensure that the Beaver Creek system is never degraded, regardless of the number of mines that actually operate, because the "bubble" concept would function to tighten the performance standards as necessary to prevent degradation.

II. *The EIS Cannot Support Intelligent Decisionmaking*

An equally fundamental problem with the EIS is that it does not provide a basis for intelligent decisionmaking or informed public comment. This is contrary to NEPA's basic objectives. *Oregon Natural Resources Council v. Marsh*, 820 F.2d 1051, 1054 (9th Cir. 1987).

A. *The EIS's Analysis Is Superficial*

The first problem is that in a number of key areas, the analysis in the EIS is so superficial as to be meaningless.

28-3 One stellar example of this superficiality concerns the reclamation of aquatic habitat. One of the central differences between the EIS's preferred alternative and alternative C, the environmentally preferable alternative, is their different treatment of aquatic-habitat rehabilitation. Specifically, unlike the preferred alternative, alternative C requires a mining operator to reestablish natural features, such as riffles and pools, in any reach of stream disrupted. Therefore, it is crucial that the EIS tell the decisionmaker and the public what the benefits and disadvantages of such additional reclamation would be. Yet this is not done.

Instead, all that the EIS says is that under alternative C, "replacement of habitat will minimize the long-term impacts to fish habitat." EIS at 4-44. This is so obvious as to be completely unhelpful. Plainly, it falls far short of providing a useful level of detail. What the EIS should do is address relevant questions like what the biological productivity of reclaimed stream reaches would be under the two alternatives, as measured, say, in diversity and quantity of aquatic life, and how long stream rehabilitation would take under each alternative. **28-3 cont'd**

Nor is it simply aquatic habitat that is given short shift and superficial analysis. The most basic purpose of the White Mountain National Recreation Area is to provide recreational opportunities to the public. ANILCA § 1312. Yet all EIS says is that under alternative C, "the impacts on recreation and recreation-related resources will be somewhat less because of less activity." EIS at 4-56. This is not enough: BLM has an obligation to make a quantitative estimate (in man-days or recreational dollars spent or some other meaningful measure) of the differences in recreational uses under the alternatives. **28-4**

Likewise, the same problems plague other parts of the EIS. BLM says that under the preferred alternative, mining will cause "significant short and long-term increases in suspended sediment and turbidity," EIS at 4-15, while under alternative C, it will cause just "possible short-term increases in suspended sediment and turbidity." *Id.* Intelligent decisionmaking, however, requires significantly more detail -- such as estimates of exactly how much turbidity (in NTUs) each alternative is likely to generate and exactly how long (in years) the increased turbidity is likely to last under the alternatives. **28-5**

In other words, the problem with the EIS is that it does not adhere to the requirement that an EIS enable a reviewer to "evaluate the comparative merits" of different alternatives. 43 C.F.R. § 1502.14(b). In this case, no comparative evaluation is possible because the level of analysis is far too general.

B. *Essential Information Is Ignored or Missing*

At the very outset of the EIS, BLM sets forth admirable objectives for the EIS:

> The crux of the present concern is the nature, degree and extent of the cumulative impacts of mining and related activities on the physical, biological, and socio-economic environment in the four watersheds the court identified. In particular, the cumulative effects and impacts of placer mining need to be clearly explained and fully analyzed.

EIS at 1-3. Nevertheless, this "crux" is not surmounted, for in far too many key areas, the cumulative impacts of placer mining aren't "clearly explained and fully analyzed," but are ignored or dismissed on the grounds that they can't be determined.

28-6 For example, contrary to its obligation to set forth "[t]he environmental effects of the proposed action," 40 C.F.R. § 1502.16(d), the EIS expressly acknowledges that it does not address each of the following critical points:

(1) "the biological significance of the increased metals concentrations," EIS at 4-41,

(2) "the overall magnitude of adverse effects to fish populations," EIS at 4-42,

(3) "the overall cumulative effect of total suspended sediment increases," EIS at 4-43, and

(4) "the extent and magnitude of mining impacts in this basin," EIS at 3-42.

In each instance, the EIS rationalizes these shortcomings on the basis that the impacts "cannot be determined" or are "unknown."

Besides being a violation of 40 C.F.R. § 1502.16(d), the data gaps also violate 40 C.F.R. § 1502.22, the regulation on incomplete or unavailable information. That regulation states that when missing information is "essential to a reasoned choice among alternatives," it must be obtained (unless the costs are exorbitant, which is not the case here). Yet that is not done here.

III. *The Preferred Alternative Is Unlawful*

28-7 Another important problem is that BLM's preferred alternative violates several statutory and regulatory requirements.

First of all, the preferred alternative is contrary to ANILCA. The White Mountains Recreation Area was established "to provide for public outdoor recreation use and enjoyment and for the conservation of the scenic, scientific, historic, fish and wildlife, and other values contributing to the public enjoyment of such area." ANILCA § 1312(a). Therefore, since nonconsumptive uses are paramount, BLM must insure that mining will "to the maximum extent practicable" be consistent with their enjoyment. ANILCA § 402(c).

In this case, BLM has not done that. By BLM's own admission, alternative C would provide more for public outdoor recreation use and would better conserve the other special values of the area. Therefore, as it is the practicable alternative that minimizes impacts, it must be selected.

The preferred alternative is also unlawful because it would cause unnecessary and undue degradation. BLM recognizes that under the preferred alternative, mining would be conducted largely as it was in 1987. EIS at 2-6. During 1987, however, the one mine that operated had "seepage that clouded a portion of the creek for several miles." EIS at 3-15. This was a violation of the state turbidity standard and hence caused unnecessary or undue degradation. 43 C.F.R. § 3809.0-5(k).

In addition, the preferred alternative is unlawful because it violates 43 C.F.R. § 3809.1-3(d)(4)(iv). This provision requires "rehabilitation of fisheries habitat." Yet under the preferred alternative, the operator doesn't need to do any rehabilitation, but can get by with simply stabilizing the bypass channel. Therefore, only alternative C, which requires stream rehabilitation, is consistent with § 3809.1-3(d)(4)(iv). **28-7 cont'd**

IV. *Specific Comments*

A. *BLM's Cost Data Is Wrong*

At bottom, there is really only one argument for the preferred alternative: that it would cost only a fraction of what other more protective alternatives would cost, according to BLM figures. This argument, however, rests on a gross miscalculation of the preferred alternative costs.

According to BLM, the EIS takes its estimate of water pollution control costs for the preferred alternative from EPA data. Specifically, the EIS says that EPA's work shows that it costs only $5,200 to run a typical mine with "a zero discharge system with some water seepage." EIS at 2-14 to -15, -17. The actual figure in the EPA economic development document, however, is $28,700 for a mine with this type of technology, *a cost over five times BLM's estimate.* Environmental Protection Agency, *Economic Impact Analysis of Effluent Limitations for the Placer Gold Mining Industry* at VI-8 (1987). BLM's cost figure represents what it would cost to use only simple settling, a primitive technology that is no longer lawful under new EPA effluent guidelines. *Id.* **28-8**

This miscalculation, simple though it is, vitiates the entire analysis of the EIS. It vastly reduces the cost differences between preferred alternative and the most environmentally protective one -- and it thereby undermines the very foundation of the argument for the preferred alternative.

B. *BLM Has Water Quality Responsibilities*

Another error in the EIS is its assertion that BLM has no authority to regulate pollution from mining that is affecting Beaver Creek National Wild River or its tributaries. *See* EIS at 2-13. This is not so.

To the contrary, there is abundant statutory and regulatory authority justifying BLM action to protect Beaver Creek from water pollution. *See, e.g.*, 16 U.S.C. § 1283(a) ("the Secretary ... shall take such action ... as may be necessary to protect [wild and scenic] rivers"); 16 U.S.C. § 1701(a)(8) (BLM shall ensure that "the public lands [are] managed in a manner that protects the quality of ... water resources"); ANILCA § 1312(a) ("the White Mountains National Recreation Area ... shall be administered by the Secretary to provide for the ... conservation of ... fish ... and other values contributing to public enjoyment"); 43 C.F.R. § 3809.0-5(k) ("unnecessary or undue degradation" includes "failure to comply with applicable **28-9**

28-9 cont'd

environmental statutes and regulations"). Indeed, in passing ANILCA, Congress specifically directed BLM to protect national wild and scenic rivers from pollution from mining:

> We expect the Secretary to use his authority under the Federal Land Policy Management Act to manage publicly owned watersheds adjacent to the designated river corridors in such a manner as to not jeopardize the wild and scenic rivers. ... *Such management would involve careful control over mining ... that could result in pollution and siltation of tributaries to designated wild and scenic rivers.*

126 Cong. Rec. H10543 (daily ed. Nov. 12, 1980) (excerpt of "detailed discussion" submitted Rep. Udall).

28-10

This point has important practical ramifications. It means that it is unlawful for BLM to leave the issue of mixing zones or "variances" for mining discharges entirely to EPA and the Alaska Department of Environmental Conservation -- as BLM proposes to do in the preferred alternative. To the contrary, because BLM is charged with protecting Beaver Creek, BLM must ensure that any mixing zones or variances proposed by other agencies are stringent enough to protect the river. And of course, this in turn means that the EIS needs to examine what kind of mixing zones or variances, if any, would be appropriate -- which is yet another shortcoming in the present draft.

C. *The EIS Does Not Identify the Controlling Legal Standards*

28-11

In the EIS, BLM states that its duty is primarily, if not exclusively, to prevent mining from causing unnecessary or undue degradation of the public lands. EIS at 1-7 (table). While this is indeed one of BLM's duties, BLM has others too, including ones that are more restrictive and hence more important for present purposes. For example, the Wild and Scenic Rivers Act requires BLM to "take such action ... as may be necessary to protect such rivers," 16 U.S.C. § 1283(a), and ANILCA requires BLM to regulate mining "to the maximum extent practicable." ANILCA §§ 1312(a), 402(c). Therefore, the revised EIS should set forth these more stringent limitations and use them in evaluating which alternative can lawfully be adopted.

D. *The Erosion Figures Are Suspect*

28-12

The figures used in the EIS to estimate erosion from mining sites are based upon EPA estimates developed in the continental United States. EIS at A-14. These are suspect, however, because Alaska conditions are quite different; to take but one example, Alaska mines rip up permafrost, which when disturbed is far more erosion-prone than other soils. The EIS, therefore, must either adapt its figures to Alaska conditions or explain why the continental figures can be considered reliable in Alaska.

E. *The EIS's Analysis Should Not Stop after Ten Years*

Under the CEQ regulations, BLM has an obligation to evaluate all "reasonably foreseeable" future impacts when analyzing cumulative impacts. 40 C.F.R. § 1508.7. The EIS does not do this, however. It is reasonably foreseeable that active mining will continue for more than ten years; at the very least, the EIS provides no reason for thinking that mining will stop then. Therefore, BLM needs to consider what the impacts of the various alternatives will be, say, thirty or fifty years from now, assuming a continuation of active mining. It cannot simply assume that all mining will magically cease ten years from now. **28-13**

F. *Enforcement*

The purpose of the Beaver Creek EIS, at bottom, is to help BLM develop a management plan for regulating the impacts of placer mining within the drainage. An important part of such a management plan, of course, is enforcement. Nevertheless, there is no discussion of BLM's intended enforcement efforts in the draft. The next draft EIS should therefore evaluate several different enforcement alternatives, so that BLM is in a position to select a successful enforcement strategy. **28-14**

G. *Flood Risks*

An important cause of source of adverse impacts from mining is flooding. For instance, a mine may save up a season's worth of sediment in a settling pond, only to see all the sediments dumped back into the stream during a fall or spring flood. Yet in this area, as in others, there is essentially no analysis. In the next EIS, therefore, BLM should identify the floodplain of Beaver Creek (and each tributary with active mining claims) and then formulate and evaluate alternatives for protecting mining activities in these areas from flooding. And BLM should also evaluate what may be the best alternative of all -- requiring that all mining be kept out of the floodplain in the first place. **28-15**

H. *Bonding*

One management option available to BLM to regulate mining impacts is bonding. 43 C.F.R. § 3809.1-9. Therefore, BLM should look at the pros and cons of using various possible bonding strategies (including a strategy of mandatory bonding) in the EIS. Nonetheless, there is no mention of this anywhere in the EIS. **28-16**

I. *Abandoned Mines*

Abandoned mines continue to contribute to the adverse cumulative impacts within the Beaver Creek drainage. For example, due to past mining, Nome Creek **28-17**

28-17 cont'd has a sterile and poorly defined channel -- and one that contributes significant nonpoint-source pollution to the Beaver Creek system. *See generally* EIS ch. 3. Nevertheless, although these past actions thus cause contemporary impacts, the EIS prqposes no alternatives for mitigating them. Upon revision, this deficiency should be rectified.

28-18 Specifically, the revised EIS should evaluate as an alternative a plan that would require mining operators to reclaim the previously disturbed areas within the drainage as a form of "off-site mitigation." *See* 40 C.F.R. § 1508.24(e) (defining "mitigation" to include "compensating for the impact by replacing or providing substitute resources or environments").

J. *Worst-Case Analysis*

28-19 The worst-case analysis is far too abbreviated in the EIS. BLM needs to do more than display a single page table of worst-case results. *See* EIS at 2-26. Instead, to satisfy its NEPA obligations, the agency should include details of the worst-case scenario in the environmental consequences section of the EIS. This is especially important because the worst case is not farfetched -- it will be realized if only 26 mines operate annually.

V. *A Supplemental Draft Should Be Circulated*

Because of the many serious deficiencies in the current draft EIS that need correction, BLM should circulate a new draft EIS for public comment. *See* 40 C.F.R. § 1502.9(c).

I appreciate the opportunity to comment on the draft and look forward to working with you on this project in the future.

Very truly yours,

Philip S. Barnett

Philip S. Barnett

cc: Emily Barnett, Sierra Club
Susan Alexander, The Wilderness Society
Randy Rogers, Northern Alaska Environmental Center
Susan James, Anchorage
Winston James, Birch Creek Village
Bergman Silas, Minto
Andy Jimmie, Minto
Ron Silas, Tanana Chiefs Conference

28-1 See response 21-2 and Section 1.6.

28-2 See Section 2.4, for the addition of a range of alternatives which considered thresholds, but were not analyzed in this EIS.

28-3 See Section 4.7.

28-4 Section 4.10 has been revised to provide more specific discussion of the consequences of the various alternatives to recreation.

28-5 This has been done where sufficient data are available to make such an analysis possible. For most parameters the data are not available. The value of such an analysis is further minimized by the relatively minor amount of mining activity anticipated in the basin, the zero contaminant discharge requirement, and the recent mitigation measure requirements established.

28-6 See response 20-6 and revisions to Section 4.4.

We believe that the environmental impacts of placer mining on the Beaver Creek drainage have been significantly lessened during the past few years because of management under the 43 CFR 3809 regulations. While we do agree that data are limited for the watershed, available data indicate that Beaver Creek water quality is improving and that spending exorbitant amounts of money on a monitoring program before mining can take place again would produce only incomplete results.

28-7 Section 1312(a)(3) on ANILCA states that the Secretary has the discretion to manage, utilize, and dispose natural resources and continue such existing uses and developments as promote, or are compatible with, or do not significantly impair public recreation in the White Mountains National Recreation Area. Further, the Secretary may utilize such statutory authorities available to him for the conservation and management of natural resources as he deems appropriate for recreation and preservation purposes and for resource development compatible therewith. Furthermore, Section 404(b) of the act, prescribes that the National Recreation Area shall be subject to such reasonable regulations to assure that mining will, to the maximum extent practicable, be consistent with protection of the scenic, scientific, cultural, and other resources of the area.

Thus, BLM believes that the Proposed Action is within the law because Congress gave the Secretary discretion to manage mineral development under reasonable regulation. The Proposed Action which applies the State of Alaska's water quality standards and EPA's effluent guidelines, along with the increased reclamation standards found in Alternative C, will allow for compatible development of the mineral resources and conservation of natural resources in the area.

28-8 The Proposed Action in the DEIS has been rewritten to clarify a misconception that a zero discharge water treatment system would be required to meet the water quality performance standards. In actuality, the water quality standard for the Proposed Action could probably be achieved by

a mine with a properly operating simple settling water treatment system and an EPA variance for turbidity. The cost figures for water treatment have been revised to reflect a more appropriate sized mine that processes approximately 50,000 cubic yards per year versus 150,000 cubic yards.

28-9 Mining operators are required to meet the water quality standards established by EPA and ADEC.

28-10 Refer to response 4-1.

28-11 Figure 1-2 has been revised, as has the text of Sections 1.6, 1.7, and 1.8.

28-12 See additions to Section 4.4.

28-13 The EIS does not assume that mining will cease after ten years, but analyzes a ten year time frame as a reasonable expectation of future impacts.

We expect similar impacts to continue for additional ten year periods using alternatives under current mining technology.

Ten years is the cycle for revisiting the RMPs. As knowledge of the area increases, and mining technology changes, it is reasonable to assume that impacts from mining ten years will be different, and should be reevaluated at that time.

28-14 See Record of Decision and Section 2.3.1.

28-15 Regulations for process water treatment systems currently require that such systems be sized sufficiently to handle predicted flood flows. Operators with valid claims have a right to operate while in compliance with existing legislation and regulations. As placer deposits occur in flood plains, any requirement eliminating mining from floodplains would abrogate those rights.

28-16 See Section 2.3.1. Also see Section 560 of Act of October 30, 1986, Public Law No.99-591, which sets forth Congressional policy that bonding is to be discretionary.

28-17 See White Mountains NRA RMP and response 20-4.

28-18 The 43 CFR 3809 regulations require operators to reclaim post-1981 disturbed areas. There are no requirements for reclamation of areas disturbed prior to 1981.

28-19 The worst-case analysis has been recalculated and the decision expanded. See Appendix B-2 for revised worst-case analysis.

To Whom it May Concern: 6-18-88

I support full protection of recreation and conservation values of Beaver Creek & Birch Creek and object to current Proposed Action on the grounds that it clearly facilitates mining to the detriment of other uses.

The conclusions which the EIS (draft) regarding the reduced benefits of implementation of full reclamation practices & water quality control measures are objectionable. The reclamation practices defined under Alt. C should be required.

Water quality control measures must be designed to fully comply with all State & federal standards!

Unless the final action includes adequate measures to protect the other resources and values of these areas, such as in Alt. C, the only other viable alternative is "No mining".

Sincerely, Jeffrey & Susan Sloss

Hello,

I'd like to comment on the draft EIS's for Birch & Beaver Creeks. While I am a geologist, & favor placer mining if it is conducted in a manner responsible to other resource values, it appears that the "proposed action" plan is not responsible:

- The reclamation procedures are unacceptably weak. Alternative C represents a minimal standard for any wild & scenic river. The Interior is full of unsightly & barren tailings from past operations; better practices are unquestionably necessary.
- Water quality measures should permit no degradation of water quality, & should fully comply with all state & federal standards. Short term measures proposed are too weak, & inadequate reclamation measures will also result in long-term degradation.

30-1 It should be remembered that the White Mountains NRA, Steese NCA, & the Wild Rivers were designated to ensure that recreation & conservation uses had clear priority over such uses as mining, which can interfere with virtually all other uses. If there is a conflict in such an area, mining must take second place. The draft

EIS indicates that these legislatively mandated priorities have been reversed. If mining is not done in a responsible manner, other users will have no choice but to push for a "no mining" alternative. This sort of "lose-lose" situation could be easily avoided by simply requiring miners to recognize that they are not the only users, & requiring them to clean up! 30-1 cont'd

Thank you
[illegible]
Bill [illegible]
PO Box 2[illegible]
[illegible]
[illegible]

JUN 22 11 27 AM '9[illegible]
BLM AK SO 950

30 Continued

30-1 See Section 1.6 for discussion of legislation and BLM management mandates.

Brian Allen
Deborah Niedermeyer
754 9th Avenue
Fairbanks, Alaska 99707

June 19, 1988

Beaver Creek EIS
Richard Dworsky
Bureau ofLand Manangement
701 C Street, Box 13
Anchorage, Alaska 99513

Dear Mr. Dworsky,

We recently completed our second canoe trip down Beaver Creek, starting at Nome Creek. On the first day of our first trip, in 1980, Nome Creek was opaque with mining silt. On this trip, startng June 5, Nome Creek was running near clear, a welcome improvement. Still, the water was not running as clean as Beaver Creek, which was astonishingly clear above Nome Creek on June 7. 31-1

BLM must remember that Beaver Creek can run wonderfully clean. To maintain such a pristine river is the mandate of the Wild and Scenic River Designation and the National Recreation Area. It is for these reasons that we suppport Alternative C of the land management options for mining. Zero Discharge and the restoration of natural landscape, creek channels and vegetation after mining are both feasible and suitable for a special river so close to Fairbanks.

We do not support alternatives A or B, because their adverse consequences for downstream water qualtiy have been downplayed in the Draft Cumulative EIS. The cumulative impacts of mining discharges, combined with the damamge still being done by old mining are significant, especially for downriver turbidity. Contrary to the EIS, we do not think that spring break up will flush out the river, and prevent cumulative damage from new mining in the coming years. (4-13) Furthermore, Nome Creek is still suffering from the damage of old mining, since the stream bed is layered with the miningsilt and sediment of past seasons. During high water, the stream runs dirtier than similar undisturbed streams do and this condition will persist for many years until the old mining silt is cleaned out or stabilizes. This continuing degradation of Nome Creek from past mining provides additional incentive to regulate current mining closely. We urge BLM to use management option C.

Sincerely,

Brian Allen

Brian Allen

31-1 The conditions observed on your trips have been incorporated in Section 3.10.

Donald C. Pendergrast
1744 Bridgewater Drive
Fairbanks, Alaska 99709
(907) 452-7616

Beaver Creek/Birch Creek EIS's
c/o Richard Dworsky
Bureau of Land Management
701 C Street, Box 13
Anchorage, Alaska 99513

June 17, 1988

To whom it may concern:

Because placer mining is an important industry here in the interior of Alaska its future is assured. As long as there is "gold in them thar hills", or rivers, there will be miners there to extract it. I have no problem with that. I do however have an objection, a serious objection, to the adverse affects that placer mining has had and continues to have on our public lands and waterways.

The Bureau of Land Management as the manager of much of the lands and waterways effected by placer mining has a duty to vigorously protect the public lands, and to enforce the laws regarding the protection of these land, water, and wildlife resources. I believe that the BLM must insist on compliance with the federal and state water quality regulations and standards. And that mining operations must obtain the appropriate permits, and operate within the permit's restrictions, even if this means installing "zero discharge" water treatment systems.

Referring more specifically to the draft EIS for Birch and Beaver Creeks, I support the reclamation practices outlined in Alternative C, which should maximize the recovery of the disturbed mining areas. Because these streams and the mining activity lie within the White Mountains National Recreation Area, the Steese National Conservation Area and are National Wild Rivers, it is imperative that clean mining operations, and subsequent reclamation practices, be of the highest order. In these areas recreation and conservation values must be given priority over mining if a conflict exists.

In conclusion I would like to reiterate that BLM has the responsibility to protect the recreation, conservation, and water quality in the Beaver Creek and Birch Creek drainages. The greatest continuing threat to these is placer mining. However, placer mining can be regulated and carried out in such a fashion so that its effects are greatly reduced. I hope that BLM will do its duty to insure that mining operations meet all water quality regulations, and that proper and speedy reclamation methods will be employed. The alternative to enforcing these laws and regulations is to ban placer mining from these areas, which no one wants to see.

Sincerely,

Donald C. Pendergrast

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32 Continued

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Fairbanks, Alaska 99709
(907) 452-7616

Beaver Creek/Birch Creek EIS's
c/o Richard Dworsky
Bureau of Land Management
701 C Street, Box 13
Anchorage, Alaska 99513

June 17, 1988

To whom it may concern:

Because placer mining is an important industry here in the interior of Alaska its future is assured. As long as there is "gold in them thar hills", or rivers, there will be miners there to extract it. I have no problem with that. I do however have an objection, a serious objection, to the adverse affects that placer mining has had and continues to have on our public lands and waterways.

The Bureau of Land Management as the manager of much of the lands and waterways effected by placer mining has a duty to vigorously protect the public lands, and to enforce the laws regarding the protection of these land, water, and wildlife resources. I believe that the BLM must insist on compliance with the federal and state water quality regulations and standards. And that mining operations must obtain the appropriate permits, and operate within the permit's restrictions, even if this means installing "zero discharge" water treatment systems.

Referring more specifically to the draft EIS for Birch and Beaver Creeks, I support the reclamation practices outlined in Alternative C, which should maximize the recovery of the disturbed mining areas. Because these streams and the mining activity lie within the White Mountains National Recreation Area, the Steese National Conservation Area and are National Wild Rivers, it is imperative that clean mining operations, and subsequent reclamation practices, be of the highest order. In these areas recreation and conservation values must be given priority over mining if a conflict exists.

JUN 21 8 24 AM '88
BLM AK SO 950

In conclusion I would like to reiterate that BLM has the responsibility to protect the recreation, conservation, and water quality in the Beaver Creek and Birch Creek drainages. The greatest continuing threat to these is placer mining. However, placer mining can be regulated and carried out in such a fashion so that its effects are greatly reduced. I hope that BLM will do its duty to insure that mining operations meet all water quality regulations, and that proper and speedy reclamation methods will be employed. The alternative to enforcing these laws and regulations is to ban placer mining from these areas, which no one wants to see.

Sincerely,

Donald C. Pendergrast

Donald C. Pendergrast

32 Continued

10181 Curvi St.
Anchorage, AK 99516
16 June 1988

Beaver Creek EIS
c/o Richard Dworsky
Bureau of Land Management
701 C St. Box 13
Anchorage, AK 99513

I am writing in support of alternative C. This alternative provides the best balance between protection of the environment and cost to the federal government. Clearly, placer mining is a very minor economic activity in Alaska, especially when viewed in light of potential environmental impacts. The federal government should neither be in the business of buying up claims nor of allowing any unnecessary degradation of environmental quality.

Sincerely,

Ken Zafren

JUN 21 9 19 AM '88
BLM AK SO 950

Internal Medicine Associates, Inc.
A Professional Corporation
2841 DeBarr Road, Fifth Floor
Anchorage, Alaska 99508
Telephone 276-2811

PULMONARY:
Beth A. Baker, M.D., FCCP
George L. Stewart, M.D.
Norman J. Wilder, M.D., FCCP, FACP

GASTROENTEROLOGY:
Richard F. Buchanan, M.D.
Charles R. Shannon, M.D.
James B. Watson III, M.D.

RHEUMATOLOGY:
Michael B. Armstrong, M.D.

INFECTIOUS DISEASES:
Paul L. Steer, M.D., FACP

NEPHROLOGY:
Steven B. Tucker, M.D.

HEMATOLOGY/ONCOLOGY:
Mary L. Stewart, M.D.

ONCOLOGY/INFECTIOUS DISEASES:
Frank M. Domerat, M.D.

June 13, 1988

Beaver Creek/Birch Creek EIS'S
c/o Richard Dworski, BLM
701 C Street
Box 13
Anchorage, AK 99513

TO WHOM IT MAY CONCERN:

It is vitally important that a balance between environmental concerns and potential economic development be rigidly enforced. In my opinion it is vital, therefore, that the BLM protect the recreational and environmental value of lands proposed for development.

I believe that a reasonable balance between both interests can be maintained but neither should be favored over the other.

Sincerely yours,

Steven B. Tucker, M. D.

SBT:csw

June 19, 1988

Beaver Creek/Birch Creek EISs
c/o Mr. Richard Dworsky
U.S. Bureau of Land Management
701 C Street, Box 13
Anchorage, Alaska 99153

Re: Beaver Creek/Birch Creek Draft Environmental Impact Statements

Dear Mr. Dworsky:

This letter contains my brief comments and recommendations on the above-referenced DEISs. Please consider my input, and include this letter in the appropriate hearing record.

At the outset, I oppose the current Proposed Actions within these DEISs, because they clearly promote mining at the expense of other legally-mandated public uses and resource values. I urge BLM to abandon these ill-conceived Proposed Actions. Instead, please choose a final recommended alternative which will fully comply with the purposes and management requirements for the White Mountains National Recreation Area, the Steese National Conservation Area, and the National Wild Rivers within them. The chosen alternative must protect diverse wildlife and other resource values, and maintain recreational opportunities.

I also oppose conclusions within the DEISs which downplay the benefits which would occur through implementation of full reclamation practices and water quality control measures. Data within these DEISs indicates substantial differences in site recovery and impacts to aquatic systems, depending upon which alternative is implemented. The Final EISs should reconcile these differences and benefits in terms of choosing an environmentally sound and legally sufficient alternative for implementation.

I support and endorse the reclamation practices described under Alternative C. This alternative contains reclamation practices which enhance recovery of mined areas and return mined streams to productive fisheries habitat. Such recovery must occur within a reasonable period of time.

BLM should require water quality control measures which will comply with all state and federal water quality standards and permit limitations. In particular, BLM must actively protect the natural values of the two National Wild Rivers. In other words, BLM should not allow any degradation of water quality within these National Wild Rivers. This may require implementation of "zero discharge" water quality treatment systems.

Finally, if BLM fails to adopt adequate measures to protect water quality, wildlife, and other natural resources, then I would endorse the "no mining" alternative. Mining should not be allowed, unless it can be done in an environmentally-acceptable fashion, and without adverse impacts on water quality, wildlife, fisheries, and other resource values.

Thank you very much for considering my views.

Sincerely,

Richard Spotts

Richard Spotts

RS/js

5604 Rosedale Way
Sacramento, CA 95822

6/21/88

Dear BLM,

After careful review of the issues surrounding the Environmental Impact Statements evaluating the cumulative effects of multiple placer mining operations on the watersheds of Beaver Creek and Birch Creek National Wild Rivers, I'd like to state the following.

I feel it very important that the final recommended alternative be designed to fully comply with the purposes and management mandates for the White Mountains National Recreation Area, the Steese National Conservation Area and the National Wild Rivers within them. Protecting these areas must be given priority over any mining claims, and I object to the current proposed action because it facilitates mining to the detriment of the legally mandated public uses of the area.

I also object to the conclusions of the draft EIS's which downplay the benefits which can be gained through implementation of full reclamation practices and water quality control measures

I'd also like to see water quality control measures be designed to fully comply with all state and federal water quality standards and permit limitations. I'd like to see the BLM protect the values of the two National Wild Rivers by not allowing any degredation of water quality

Unless final action includes adequate measures to protect the special resources of the Steese/White Mountains such as those included in Alternative C, the only other viable alternative will be the "no mining" alternative which I have not chosen to endorse at this time!

Sincerely
James A. Berg

John Vincent Rosapepe
P.O. Box 104576
Anchorage, AK 99510
June 21, 1988

Mr. Richard Dworsky
Beaver Creek/Birch Creek EISs
Bureau of Land Management
701 C Street, Box 13
Anchorage, Alaska 99513

Dear Mr. Dworsky:

I am writing to request that the final regulations evaluating the cumulative effects of multiple placer mining operations on the watersheds of Beaver Creek and Birch Creek National Wild Rivers fully comply with the purposes of the management mandates for these areas which require the protection of recreation and conservation values when conflicts with mining exist. Also, water degration must not be allowed to occur and all water quality control efforts should completely comply with federal and state efforts.

I support the alternatives listed under Alternative C. I hope BLM this time around will require stringent measures which allow for placer mining, yet at the same time will protect fisheries habitat and other water quality if possible. Unfortunately, BLM has not done this in the past and hopefully now,it will correct past policies which have required legal means by outside parties to set straight.

Sincerely,
John Vincent Rosapepe
John Vincent Rosapepe

FAIRBANKS HUB OF THE INTERIOR

Greater Fairbanks **Chamber** of Commerce

First National Center P.O. Box 74446
709 Second Avenue (907) 452-1105 Fairbanks, Alaska 99707

RESOLUTION #26-0688

RESOLUTION SUPPORTING BLM E.I.S. PROPOSED ACTION
ON BEAVER CREEK PLACER MINING OPERATIONS

WHEREAS, the BLM studies were prepared by qualified professionals, with input from competent government agencies and civilian firms, and

WHEREAS, the BLM should be commended for the thorough analysis and evaluation of the environment and placer mining activities in the study areas, and

WHEREAS, the economic impact of placer mining on the Fairbanks economy is substantial, (placer mining contributed about $46 million in sales, $9.5 million in salaries and wages of about 625 full-time employees in 1985) and

WHEREAS, the proposed action recommended by BLM is to continue management of mining claims on Federal lands as done in 1987, which required reclamation of mining areas and meeting current EPA affluent guidelines and ADEC water quality standards, or the existing EPA/ADEC variance for the operation, and

WHEREAS, alternatives to the proposed action would impose increasingly stringent standards, ultimately disapproving any new applications for mining, and

WHEREAS, the BLM estimates that under the proposed action the economic benefits to Fairbanks from placer mining in the three study areas would increase by 23% in the coming decade, with the largest proportion from the Birch Creek district, and

WHEREAS, there would be considerably less increases under Alternatives A and B, and declines under Alternatives C and D, and

WHEREAS, the environmental impacts from the proposed action would be least in the Beaver Creek drainage and greatest in the Birch Creek district, and

WHEREAS, an increase from the present one mine to five mines would result in a minimum of surface disturbance, with consequent minimal reduction in wildlife population potential, and no long term impact on fisheries resources. Potential impacts to subsistence users and resources would be negligible:

JUN 25 2 09 PM '86
BLM AK SO 950

NOW, THEREFORE BE IT RESOLVED THAT in view of the above, the Greater Fairbanks Chamber of Commerce:

a. Commends the Bureau of Land Management for the excellence of their assessment of the three placer mining districts reviewed, and their sensitivity to the placer mining industry as well as to the environmental and social issues involved;

b. Supports the BLM proposed action for surface management in the affected watersheds;

c. And will continue to support research in placer mining technology and reclamation to mitigate the adverse effects on water quality and aquatic resources which affect downstream inhabitants and other users of these resources.

Signed this 20th day of June 1988.

By Mike Kelly
Mike Kelly
Chairman

By
W.R. Cox
President and CEO

38 Continued

Tanana Valley Sportsmen's Association
INCORPORATED
P.O. Box 669 Fairbanks, Alaska 99707 Phone 479-3367

6/28/88

Michael J. Penfold, Director
Alaska State Office, Bureau of Land Management
701 C St., Box 13
Anchorage, Alaska 99513

Dear Mr Penfold,

The Tanana Valley Sportsmen's Association is very impressed with the timely and intensive production of the Beaver Creek, Birch Creek, and Forty Mile Draft Cumulative Environmental Impact Statements. We wish to offer comments on all three statements, and on the Minto Flats Statement that is yet to come.

The documents portray the changes in the land associated with placer mining in what reads to be an exclusively negative fashion. We suggest that the word destruction' be used with great care, if at all. There is no question that following the completion of placer mining, or for that matter a BLM prescribed burn, the environment is changed. But for BLM to editorialize this change and characterize it as destruction is not accurate, not appropriate, and unsupportable with the facts.

In the more than 50 years that TVSA has been involved in wildlife management, we have supported many habitat enhancement programs, these include prescribed burns,

mulching (often with a bulldozer) willows more than ten years old to create new and more productive growth, and the construction of ponds for waterfowl loafing and nesting habitat. It is clear that placer mining, especially modern mining with hydraulic bulldozers can achieve much of the same effect.

The goal of habitat enhancement programs is to increase the diversity of the available habitat. Younger successional stages of plants then are intermixed with the surrounding older, and, for many species, less productive habitat.

TVSA actively opposed the BLM fire supression policy created after WW II, and supported the statewide Interagency Fire Management Plan in effect today. It is the opinion of TVSA and many others that the total fire supression plan of BLM greatly reduced the diversity of the natural habitat in Interior Alaska. Placer mining can recreate a very small portion of that diversity and this should be clearly stated in the EIS documents.

Placer mined areas that have naturally revegetated contain a higher number of beaver. Beaver is a lower trophic level species, they help support populations of wolverines, wolves, otter, bear and other predators. Their ponds, along with ponds left by miners (unless BLM requires

39 Continued

them to be obliterated) are of value to waterfowl, muskrat and some species of fish. Beaver is an easily measured environmental barometer indicative of the positive impacts that mans presence can have upon the environment.

TVSA is most concerned that BLM is adopting, without fact or justification, the popular eco-theology that man is the nexus of all that is destructive and evil in the world. Please change the tone and balance of your final document to reflect changes as changes, not destruction. Please take some time to explain that the most productive portions of the succession that occurs after mining is within the first few years, not the 100 or more years included in your graph on p. 4-19 (Beaver Creek).

In summary we believe that BLM needs to recognize the difference between the impacts of modern mining with bulldozers, and the impact accountable to the deposition of washed coarse rock from the dredges of a bygone era. BLM should also encourage miners to leave behind ponds, either as depressions below the watertable or as dammed settling ponds, for the benefit of waterfowl. The creation of these ponds might, in a small way, compense for the irresponsible manner in which the Department of the Interior has ignored its obligations under the Migratory Bird Treaty (USC 86-3657, Outdoor Council vs. Dunkel).

39 Continued

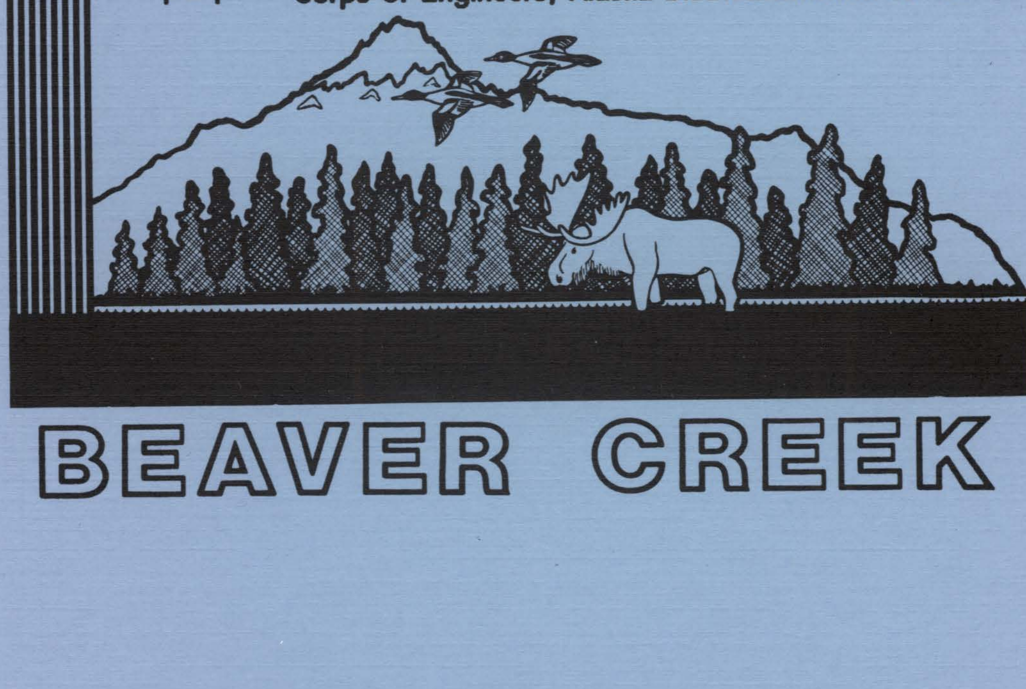
When natural and man-caused environmental changes are objectively examined wildfire, floods, natural erosion, long-term climatic changes, highway construction, gravel extraction, agricultural development, residential development, over hunting, over fishing, and lack of compliance with accepted conservation principles are all of greater environmental impact than properly regulated placer mining.

Sincerely Yours,

Bud Burris

Oliver "Bud" Burris
Wildlife Biologist,
Co-Chairman, Legislative Affairs Committee

Appendices



BEAVER CREEK

Appendices

Appendix A-1, Summary of Contractor Reports

1. Alaska Division of Geological and Geophysical Surveys (DGGS)

A cooperative agreement was entered into between the Bureau of Land Management (BLM) and the Alaska Division of Geological and Geophysical Surveys. The agreement provided additional funds and logistical support to DGGS for it to collect and analyze stream discharge, water quality, biologic information, and perform synthesis work during 1987. The agreement called for DGGS to attempt to evaluate the cumulative environmental effects of placer mining in the Birch Creek, Beaver Creek, and Fortymile River drainages. In addition, DGGS would also attempt to assess the cumulative impacts of mining on subsistence activities in the Birch Creek and Minto Flats watersheds.

Two reports were produced by DGGS, "Water quality and discharge data from selected sites in the Fortymile and Tolovana Drainages, Summer 1987," written by Stephen F. Mack, Mary A. Moorman, and Linda Harris, and "Compilation of stream macroinvertebrate data for the Birch Creek, Beaver Creek, Fortymile, and Minto Flats drainages, Alaska," written by Mary A. Maurer. Additional data was supplied to the BLM on computer diskettes for stream discharge in the Tolovana and Fortymile drainages by Steve Mack and John Bauer, the latter from the Alaska Department of Environmental Conservation. BLM receipt of these products is considered to constitute completion of the project.

2. Alaska Department of Fish and Game (ADF&G)

The Alaska Department of Fish and Game Habitat Division was contracted to prepare a report for the BLM on the aquatic habitat for all watersheds addressed in Sierra Club v. Penfold. The contract also called for ADF&G to provide the BLM with extant data on computer disks in the Lotus 123 format regarding hydrogeology, water quality, and geochemistry in the four watersheds of concern.

A final report entitled "Aquatic habitat and fisheries for seven drainages affected by placer mining: Chatanika River, Tolovana River, Goldstream Creek, Birch Creek, Fortymile River, Beaver Creek, Minto Flats," was filed with the BLM in December, 1987.

3. Hagler, Bailly and Company

Hagler, Bailly and Company of Washington, D.C. was contracted to prepare an analysis of the economic and historical relationship of placer mining in Interior Alaska. The Hagler, Bailly study addressed the history of placer mining in the four watersheds, current status of the industry and its socio-economic impacts, and a projection of levels of future mining activity based on the results of research, synthesis, and interpretations of extant information. Hagler, Bailly and Company subcontracted substantial portions of the study to L.A. Peterson and Associates of Fairbanks, Alaska. This work was facilitated, administered, and funded by BLM-Washington Office (680).

A report was sent to the BLM in December, 1987.

4. Environmental Services, Ltd. (ESL)

Environmental Services, Ltd. provided a "Model Environmental Assessment (EA)" upon which the BLM could base the preparation of EAs for each placer mining operation starting in 1988 as directed by order of the District Court in the Sierra Club lawsuit. A report was submitted to the BLM in December, 1987.

A second contract was entered into with ESL to provide BLM with data on wildlife for all four drainages. This report was provided to the BLM in January, 1988.

5. Arctic Hydrologic Consultants (AHC)

AHC was contracted by BLM to assess differences in water parameters between mined and unmined areas of Beaver Creek, Birch Creek, Fortymile River, and the drainages into Minto Flats (Chatanika River, Tolovana River, and Goldstream Creek.) AHC was also to provide a comparison of water quality values in mined areas with State and federal water quality regulations, as they apply to receiving water. In addition, AHC was to evaluate the state of the technology available for controlling wastewater quality at placer mining operations.

A report dealing with Birch and Beaver Creeks and the Tolovana River was delivered to the BLM on February 29, 1988.

6. Peter E. K. Shepherd

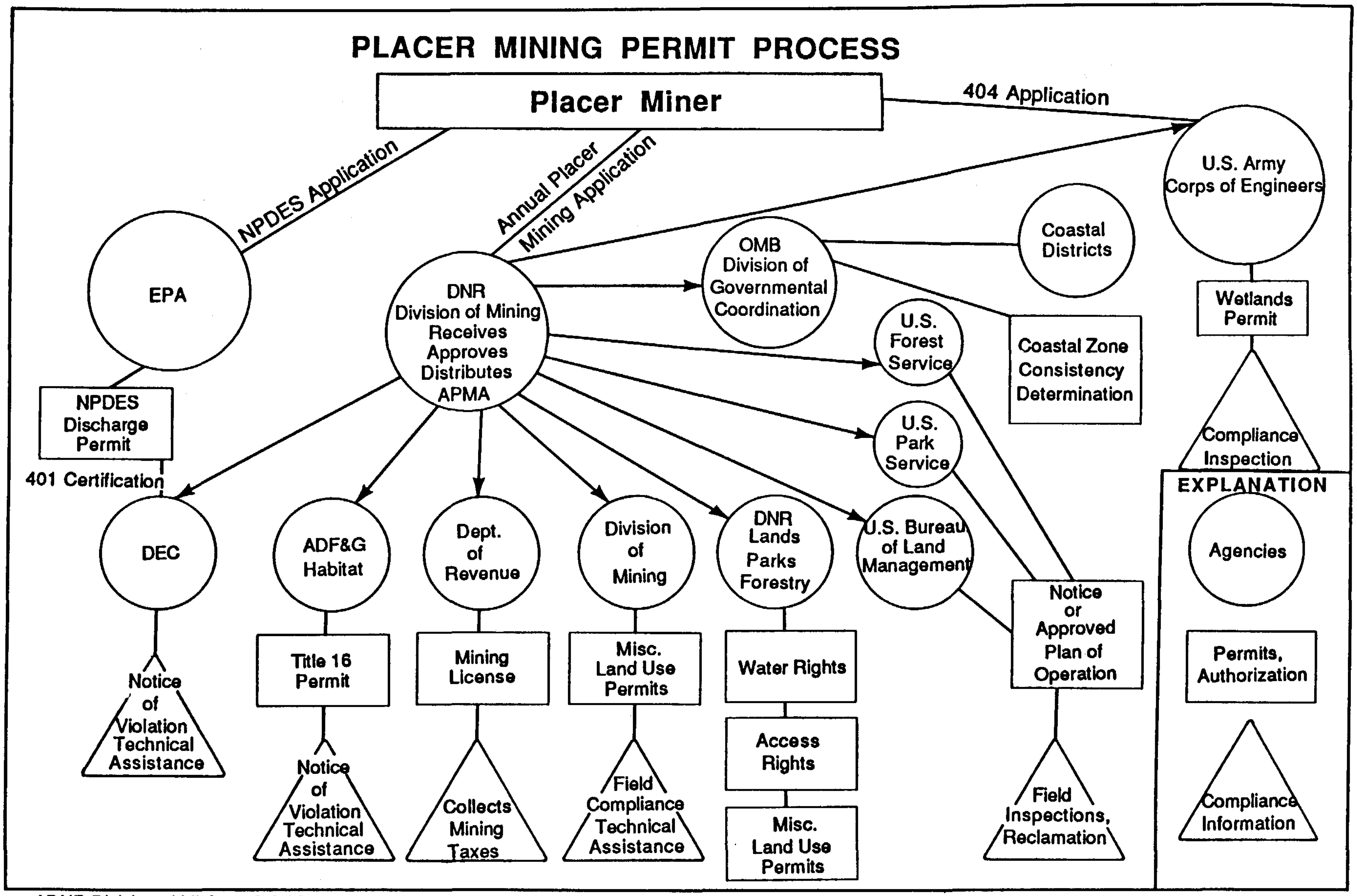
Mr. Shepherd prepared a report entitled "Impacts of Environmental Change on Minto Flats Subsistence Resources." The report examined the effects of placer mining on environmental habitats within the Minto Flats watershed and the relationship of those effects to subsistence uses and needs.

A report was submitted to the BLM in January, 1988.

7. Dames and Moore

Dames and Moore was contracted to supply a report assessing the cumulative impacts of placer mining on the aquatic communities of the four watersheds. Additionally, Dames and Moore was to provide an assessment of the impact of placer mining within each stream basin on the aquatic communities of the receiving waters. A report was sent to BLM in February, 1988.

Appendix A-2, Overview of Generalized Placer Mining Permit Process



ADNR Division of Mining 3-8-88

Appendix B-1, Methodology for Forecasting the Future Number of Mines and Roads, and Acres of Reclamation and Disturbance

The number of expected future placer miners is difficult to calculate because of regulatory uncertainty; that is, standards may be so strict as to force many operators out of business, or the cost of compliance so high that the current price of gold precludes new investments. On the other hand, improved mining techniques and equipment may encourage miners to employ these increased capabilities. Therefore, it is believed that a good measure to estimate the number of future miners is to relate the number of miners to the price of gold.

As the price of gold increases or decreases the number of miners will increase or decrease accordingly. The EIS team developed relationships utilizing a one-to-one correspondence between the price of gold and the number of miners.

Using these estimates, we reasonably expect that by 1998, the price of gold will be in the $600 per oz. range. This is a 23% increase over the highest 1987 price of $475 per oz. It is the expectation of this team that this constitutes an appropriate level of mining to evaluate over the next ten years. The following calculations were made to arrive at the expected future projections.

1. The 1981 acres disturbed was calculated from air photos.

2. The data for mines in 1987 were calculated from Alaska Placer Mining Applications and field knowledge of the BLM inspectors.

3. Estimations for 1998 were made by projecting that the price of gold would go up 23% by 1998.

4. The total number of miners in 1987 was calculated from Alaska Placer Mining Applications, and State Mineral Industry reports, and is the basis for projections of the number of miners in the future.

5. The proportional number of miners was calculated from the existing number of miners in each of the affected drainages, and included federal, State, and private operators.

6. Trends were extrapolated based on the existing operations.

7. Alternative futures were recalculated using a reduction factor in the 1987 EPA Economic Impact Analysis of Effluent Limitations report. In Table VIII-3 and VIII-4 of this report the EPA estimates that under various water quality standard options, a reduction of income will occur. This report concluded that for the small and medium operator the income reduction would range between 13% and 27%. If this is so, then we estimate that for Alternative A and B approximately 13% of the miners would not be able to afford the added cost of compliance, and for Alternative C approximately 27% of the miners could not afford the cost. For Alternative D, no miner would operate on federal claims at any cost.

8. Roads and trails were calculated by air photos, field inspections, and map analysis. The 1987 data is divided into federal, State, and joint components.

9. The projections for 1998 are estimated as follows: Relative to federal claims, current federal roads will exist and will be increased by 40% to account for new mining roads and reuse of existing mining roads. All trails will be converted to roads and counted as such. Additional trails will be developed for new mines. Roads and trails are reduced by the same 13% and 27% as discussed above to account for less mining because of water quality restrictions. Special notes are indicated for each drainage.

10. Acres of disturbance are calculated using an estimated 50-foot road width and a 30-foot trail width (Figure 4-1). Estimated disturbances from major State roads such as the Steese and Elliott highways, and housing and other developments along major rivers are not calculated in this table.

11. Mine disturbances are estimated at five acres in the first year, two additional acres in the second year, two additional areas in the third year and two additional acres of reclamation the third year. At the end of ten years we estimate that 23 acres of land will be disturbed, with 16 acres being reclaimed and total reclamation occurring at the end of the mine life.

12. Figure 2-6 discusses the cost of reclamation by alternative.

Appendix B-2, Worst Case Analysis

CEQ regulations originally required a worst case analysis for situations where there were data gaps and if is not possible or reasonable to acquire those data for the EIS evaluation of environmental consequences (40 CFR 1502.22). CEQ subsequently rescinded this regulation on May 27, 1986. However, the Ninth Circuit Court still requires a worst case as it is "a codification of prior NEPA case law...(and)...thus, the rules embodied in the regulation remain in effect even though the regulation was rescinded." (Oregon Natural Resources Council, 832 F.2d at 1497, n. 8). A "worst case situation" for environmental impacts was analyzed using the following assumptions, and the results are summarized in Figure B-1.

The value of gold would probably have to increase substantially for the actual number of mines operating in the Beaver Creek drainage to exceed the five mines projected for the Proposed Action. It is not likely that the operating costs of placer mining would be reduced in the foreseeable future to the point that would encourage a great increase in the number of mines, especially in the Wild River drainage. In fact, the trend in operating costs is upward, primarily due to water treatment costs and that should result in fewer active mines, as suggested in Alternative C. The Worst Case scenario analyzed the impacts of ten mines operating continuously for ten years. This level of activity was selected based on the following factors: 1) if a modern "gold rush" occurred, then the impact of increased mining would be shared with other mining areas in the immediate region (ie., Birch Creek and Fortymile River drainages, Fairbanks and Livengood areas), as well as the rest of the State, 2) Beaver Creek drainage has only 131 active federal claims and no State or patented

Components	Worst Case Scenario
Number of Mines **Acreage Disturbed** **Acreage Reclaimed**	10 mines operating annually 500 acres total mining disturbance (350 ac. old tailings and 150 ac. new disturbance) 500 acres to Proposed Action performance standards
Topography **Minerals**	No significant impact Increase of mineral resource production/use due to mining activity; reduction of future availability with depletion.
Soils: **-Acres of soil disturbed**	500 acres cumulative disturbance
Water Resources: **-Channel morphology miles** **-Sediment load tons/day** **-Toxic substances**	5 miles annual disturbance 1,000 tons per day No significant impact
Landcover: **-Permanently barren from mining** **-Years to regrow to shrub community** **-Threatened & endangered plants**	312 acres 30 to 50 years None expected
Wildlife: **-Acres of habitat permanently lost** **-Acres of habitat disrupted** **-Acres of habitat lost for x years** **-Acres of habitat physically altered** **-Threatened & endangered animals**	202 acres due to permanent roads 38,420 acres due to roads and trails 500 acres for 30 to 50 years 700 acres total (roads and mined acreage) No significant impact
Fisheries **-Fish populations**	Significant short term impact to local populations
Cultural & paleontological resources	No significant impact
Subsistence	No significant impact
Recreation & visual resources	Significant local impact
Economics: **-Direct mining related employment** **-Annual direct mining related income**	100 work months $100,000

Figure B-1. Summary of Worst Case Scenario.

claims, many that have been previously mined, and 3) mining equipment and experienced personnel would probably be in short supply, which would increase mining costs, thus limiting very rapid growth of mining. Additional assumptions made for the Worst Case analysis are stated below:

- The standards for analyzing the Worst Case are the same as the Proposed Action in Chapter Four.
- There would be ten active mines each year.
- Each mine would operate on a block of claims (5 to 10).
- Five acres would be mined per year.
- Fifty acres would be mined per year in the drainage.
- There would be approximately 500 acres disturbed directly by mining activity during the ten year period.
- There would be five acres reclaimed per mine annually beginning in the second year (50 acres reclaimed in years two through nine and 100 acres in year ten) for a total of 500 acres.
- Roads and trails would be built to all mines.

Appendix B-3, Methodology for Estimating the Administrative Cost of BLM's Surface Management Program and the Cost for Implementing Alternative D

The Steese/White District of BLM processed over 100 placer mining applications and inspected about 75 active mines during fiscal year 1987. For administrative cost estimation purposes, the cost of this program for fiscal year 1987 (approximately $175,000) has been divided into two parts, processing mining applications and field compliance, and has been used as the predictive model of the EISs. Considering the number of placer mining plans and notices processed, the amount of monitoring trips, and the compliance inspections completed, it was estimated that placer mining applications cost about $1,000 each to receive, review, and process and about $800 to inspect each active mine. The $1,000 estimate includes the cost of conferring with applicants, onsite inspections, and preparing Environmental Assessments when necessary. The inspection costs include transportation, two monitoring visits, two inspection trips to the mine site, and preparation time for the compliance report. Both costs include between 10 and 15% overhead for management direction and training.

The Proposed Action requires more stringent reclamation performance standards than during 1987, so a 100% increase in the compliance cost was estimated to be necessary to ensure compliance with these strict standards. An increase in BLM compliance cost would be attributed to additional inspector training and a greater number of compliance inspections. The costs for processing a placer mining application and completing compliance inspections under the Proposed Action would be $1,000 and $1,600, respectively, for a total of $2,600 per mine.

Alternative A would place less emphasis on reclamation standards than during 1987, so it was assumed that the lower reclamation standards would require fewer mine site inspections to ensure compliance and would result in an estimated 50% reduction in cost of compliance. Therefore, the costs for processing a placer mining application and completing compliance inspections under Alternative A would be $1,000 and $400, respectively, for a total of $1,400 per mine.

Alternative B would place greater emphasis on reclamation standards than Alternative A and proposes a greater level of compliance inspection than during 1987 to ensure compliance with customary and proficient mining practices and reclamation performance standards; therefore, a 50% increase in inspection costs was estimated. The greater level of compliance inspection could include increased inspector training or move frequent inspections. The costs for processing a placer mining application and completing compliance inspections under Alternative B would be $1,000 and $1,200, respectively, for a total of $2,200 per mine.

The administration of the Surface Management Program under Alternative C would be the same as the Proposed Action.

Validity exams would be conducted on all property filed mining claims (roughly 131 claims in the Beaver Creek drainage) and appraisals would be completed on all valid claims (all claims were assumed to be valid) in Alternative D. Conducting and completing validity exams and appraisals were estimated to cost about $2,000 per claim, or approximately $262,000 for evaluating all of the claims in the Beaver Creek drainage. The $2,000 claim evaluation cost was based on actual expenditures for similar evaluations conducted in the Nome Creek drainage during the summer of 1987.

The net present value (NPV) of each claim was estimated by discounting minimum and maximum claim values over a 10-year period, using a 10% discount rate. The minimum and maximum claim values were estimated by making the following assumptions:

Minimum Claim Value

- Net pay gravel thickness was three feet.
- Ten acres of each claim contained gold-bearing gravel.
- Minimum pay gravel value was $4 per cubic yard.
- Claim was mined out sometime within next ten years.
- A 10% profit for the mining operation was realized.

Maximum Claim Value

- Net pay gravel thickness was nine feet.
- Ten acres of each claim contained gold-bearing gravel.
- Maximum pay gravel value was $15 per cubic yard.
- Claim was mined out sometime within next ten years.
- A 25% profit for the mining operation was realized.

Using these minimum and maximum claim value assumptions, the gross values of gold mined would be approximately $194,000 and $2,178,000 respectively. Since the timing of the mining activity was unknown, the profit from the mining operation was spread equally over a 10-year period. This cash flow was then discounted at an annual rate of 10% to determine the NPV. The NPV for the minimum claim values would be about $12,000 and the maximum claim value would be about $335,000. The minimum and maximum NPVs for all 131 claims in the Beaver Creek drainage are $1,572,000 and $44,000,000, respectively. This simplistic approach to determining NPV values was

developed to present the magnitude of values that could be expected if the BLM selected Alternative D. The estimated claim values may not include extreme minimum and maximum values that could exist on some claims.

Appendix C-1, Geologic Time Scale

GEOLOGIC TIME SCALE			
Era	System or Time Period	Series (rocks) or Epoch (time)	Approximate Age in millions of years (beginning of unit)
Cenozoic	Quaternary	Holocene	0.01
		Pleistocene	1.7 to 2.0
	Tertiary	Pliocene	5 to 6
		Miocene	25 to 27
		Oligocene	37 to 39
		Eocene	53 to 54
		Paleocene	63
Mesozoic	Cretaceous		136 to 138
	Jurassic		190 to 195
	Triassic		225
Paleozoic	Permian		270 to 280
	Carboniferous		345 to 350
	Pennsylvanian		
	Mississippian		
	Devonian		395 to 420
	Silurian		440 to 450
	Ordovician		ca. 500
	Cambrian		ca. 570
Precambrian			

Source: from Principles of Geology. 1975; Gilluly, James (and others); San Francisco, CA; W.H. Freeman and Company; page 77.

Appendix C-2, Mineral Potential Classification System*

I. Level of Potential

O. The geologic environment, the inferred geologic processes, and the lack of mineral occurrences do not indicate potential for accumulation of mineral resources.

L. The geologic environment and the inferred geologic processes indicate low potential for accumulation of mineral resources.

M. The geologic environment, the inferred geologic processes, and the reported mineral occurrences or valid geochemical/geophysical anomaly indicate moderate potential for accumulation of mineral resources.

H. The geologic environment, the inferred geologic processes, the reported mineral occurrences and/or valid geochemical/geophysical anomaly, and the known mines or deposits indicate high potential for accumulation of mineral resources. The "known mines and deposits" do not have to be within the area that is being classified, but have to be within the same type of geologic environment.

ND. Mineral(s) potential not determined due to lack of useful data. This notation does not require a level-of-certainty qualifier.

II. Level of Certainty

A. The available data are insufficient and/or cannot be considered as direct or indirect evidence to support or refute the possible existence of mineral resources within the respective area.

B. The available data provide indirect evidence to support or refute the possible existence of mineral resources.

C. The available data provide direct evidence but are quantitatively minimal to support or refute the possible existence of mineral resources.

D. The available data provide abundant direct and indirect evidence to support or refute the possible existence of mineral resources.

For the determination of No Potential use O/D. This class shall be seldom used, and when used it should be for a specific commodity only. For example, if the available data show that the surface and subsurface types of rock in the respective area are batholithic (igneous intrusive), one can conclude, with reasonable certainty, that the area does not have potential for coal.

* As used in this classification, potential refers to potential for the presence (occurrence) of a concentration of one or more energy and/or mineral resources. It does not refer to or imply potential for development and/or extraction of the mineral resource(s). It does not imply that the potential concentration could or might be extracted profitably.

D-1 Landcover Methodology

Analysis of acreages affected by mining and reclamation were based on projected disturbance from mining and associated mining access roads and trails (Figure 4-1).

Old dredge tailings in Nome Creek remain 80 to 90% barren after 40 years. These data from Nome Creek were the basis for estimating that after being reworked, 85% of old dredge tailings would remain barren, while 15% would revegetate. This estimate is conservative, given that under all the

alternatives, the reworked tailings would be reshaped to reduce erosion and thereby enhance natural regeneration of plant cover rather than being left in steep piles. The concept of "recover with 50 years" means that the 15% vegetative cover of tall shrubs should be reestablished, stable, and productive in 50 years.

The assumption was made that 25% of previously undisturbed ground would revegetate naturally, without respreading of topsoil or fines from settling ponds. This slightly greater rate of regeneration in comparison to that predicted for old dredge tailings is entirely realistic, given that the tailings produced by modern wash plants have a greater proportion of fine-grained materials than the tailings produced by dredges.

1. Acreages for pre-1981 disturbance were interpreted from NASA high-altitude aerial photos taken from 1978 through 1981. The acreages correspond with figures for tailings given in Wolff and Thomas (1982) for Livengood and Crooked Creek. The aerial extent of disturbance interpreted from the photos probably underestimates total disturbance since the acreages were calculated from areas that still show evidence of tailings piles and barren ground.

2. Figures taken from 1987 APMAs show that approximately 50% of mining disturbance on federal claims in the Birch Creek watershed was on old dredge tailings, and 50% on new, previously unworked ground. This proportion was extended to Beaver Creek to calculate the acreage of mining which would be on "new" ground and "old" tailings.

3. Old dredge tailings in Nome Creek are 80-90% barren or sparsely vegetated after 40 years of natural regrowth. A figure of 85% was used to estimate barren acreage for mining activity on old dredge tailings, and 15% for revegetation on old tailings. Dredge tailings are "clean," with a very small percentage of fine materials remaining in the gravel tailings.

4. Mining disturbance on new ground is estimated to result in a 60% vegetation cover after reclamation and regrowth, with 40% remaining barren.

5. Mining disturbance on new ground which is not reclaimed is estimated to result in 75% barren, with a 25% vegetated cover after approximately 40 years. Washplant tailings have a greater proportion of fine-grained materials than dredge tailings.

6. Disturbed areas on dredge tailings would be extensively reclaimed with Alternative C. The addition of fine materials, fertilizer, and possible seeding would increase vegetative cover after regrowth. This level of reclamation is estimated to result in 50% vegetative cover, with 50% remaining barren.

7. Roads are assumed to remain barren, while trails are considered to be changed in vegetative cover and composition, but not rendered barren.

8. Total acreages for each alternative were calculated by adding historic disturbance, projected disturbance with associated regrowth for each alternative, and the contribution from roads or trails. Estimates for acreages for all alternatives are in Figure 4-1.

Appendix E-1, Methodology for Sediment

In 1973, the EPA estimated the various erosion rates from various land uses. While this data is based on nationwide rates and does not specifically represent Alaska, it does provide a set of parameters that can be used as a comparison. This comparison focuses on the relative contribution of ongoing and historic placer operations; proposed future contributions may thereby be placed in perspective.

One of the reasons to use this type of methodology is the issue of data. In theory, it is possible to calculate the sediment that can be put into a stream and predict the amount that will pass by a point downstream. In practice, such a task is difficult, requiring a considerable amount of sediment, hydraulic, and hydrologic data. More specifically, the types of soils, ground cover, slope and aspect, nature of the operation, microclimate precipitation, and a host of other variables suggest that an overall approach be developed for comparative purposes. This data is not available for the enjoined watersheds, except for some limited data on Birch Creek (ADEC 1986). The EIS team developed their own approach using the EPA data, then compared it to the Birch Creek data:

1) EPA (1973) estimated the representative rates of erosion from various land uses in annual tons per square mile to be:

Forest	24
Abandoned surface mines	2,400
Harvested forest	12,000
Active surface mines	48,000
Construction	48,000

2) EPA methodology does not identify the relative contributions to water courses or normal sediment traps.

3) Acreage figures were used from ongoing and projected disturbances and converted to a square mile ratio.

4) Representative rates and areas were multiplied to get suggested comparative rates.

5) Some specific assumptions were made, which in the final analysis means that our projections probably overstate the actual magnitude of the problem. The assumptions include:

a. Forest lands are estimated to be 90% of the basin, and forest cover is defined as all covered ground.

b. No regrowth and regeneration occur on previously disturbed lands.

c. Disturbances continue past 1998 but reclamation will occur at the end of the mining operation.

d. Construction of roads and other development will contribute less sediment on successive years, but this is not calculated here.

6. Figure E-1 is a summary of this evaluation.

7. When compared to Birch Creek (ADEC 1986) the following generalizations can be made:

a. The average estimated sediment load for two undisturbed basins (Boulder Creek - 30.47 square miles and Bedrock Creek - 10.35 square miles) was 0.0010 and 0.0038 tons per square mile, respectively. If these rates are projected to the entire Birch Creek drainage, and figured on a 24-hour day and a 200-day season, the projected sediment rates are 11,234.6 and 42,774.1 tons per season. This is compared to our idealized sediment from forests of 46,224 tons per year.

b. The average estimated sediment load for Birch Creek at the Steese Highway (which includes all mined areas) was 0.014 tons per hour per square mile during the 1985 field season. For projection purposes, all things being equal, using the ADEC (1986) study, the BLM would estimate that, based on a 200-day season, about 143,800 tons of sediment would find its way past the bridge monitoring station. The idealized sediment rates were calculated to be 202,820 tons per year. So the BLM estimates, in a very general qualitative way, are within about 30% of the calculated values of the ADEC study.

Category	1987				
	Annual Tonnage Rate of sediment per square mile	X	Square miles of a category in Beaver Creek watershed	=	Annual Tonnage Rate of sediment per category in Beaver Creek
Forest	24	X	1,683.00	=	40,392
Abandoned Surface Mines	2,400	X	0.55	=	1,320
Active Surface Mines	48,000	X	0.005	=	240
Construction	48,000	X	0.2	=	9,680

Figure E-1 Methodology used to obtain annual tonnage sediment rates for various categories in Beaver Creek watershed. Square mile sediment rates taken from EPA (1973). Beaver Creek watershed is approximately 1,870 square miles in area according to BLM records. Forested lands (including covered ground) are estimated to be 90% of basin.

Appendix E-2, Staking and Operating a Federal Mining Claim

A certain degree of background research is necessary to identify the general area a prospective miner may be interested in. The interested party must identify where, by legal land description, he/she intends to conduct activities. Examination of appropriate maps will aid in the proper identification of BLM lands and, when used in conjunction with the master BLM title plats (MTP) found in

the BLM public room, will help identify lands open to mineral entry. Proper identification and marking of the prospect on a topographic map to more clearly define the area of interest will aid the proponent in finding the lands of interest in the field.

After determining where the desired location is, the proponent must travel to the actual site and determine if any location markers exist. If not, the claim must be "located" by establishing clearly visible location posts or markers and then recording the claim with the proper authorities, i.e., the State of Alaska's Recording Office and the BLM (of course, a prospective miner can take a chance and not go through the process of claim location, but he/she then runs the risk of having someone else staking (locating and recording) the claim and being legally able to force them off the claim.) Once a claim is properly located and recorded, $100 worth of assessment work must be performed on the claim every year with proof of the work performed filed by December 30th annually with the BLM. If this is not accomplished and the claimant desires to keep his/her claim, he/she must file with the BLM by December 30th annually a Notice of Intent to Hold.

While it is to the advantage of any prospective miner to legally locate and file his/her claim, there is no requirement that a miner must do so prior to conducting mining activities.

The filing of a Notice, per 43 CFR 3809.1-3, is required of any operator (other than casual use operators or recreational miners as described in 43 CFR 3809.1.2) whose facilities disturb five or less acres. A Notice filing must include the name and mailing address of the mining claimant and operator, if other than the claimant; when applicable, the name of the mining claim(s); a statement describing the activities proposed and their location in sufficient detail to locate the activities on the ground; the approximate date of the onset of the activities; a description of the access routes to be constructed; a description of the equipment to be used; a statement that all reclamation of disturbed areas will be accomplished in accordance with 43 CFR 3809.1-3(d); and a statement that reasonable measures will be taken to prevent unnecessary or undue degradation of the federal lands. No recommended format for the Notice exists. (This portion may be under judicial review by the District Court).

The filing and approval of a Plan of Operations, per 43 CFR 3908.1-4, is required of any operator whose facilities disturb more than five acres. A Plan filing must include the above listed information as well as a map, preferably topographic, showing existing or proposed routes of access, aircraft landing areas, or other means of access, and size of each area where surface disturbance will occur and measures to be taken during extended periods of non-operation to maintain the area in a clean and safe manner, and to reclaim the land to avoid erosion and other adverse impacts.

BLM may do the following to ensure compliance with the reclamation of mining sites: [see other agency permits in A-2]

- Conduct field compliance inspections/monitoring
- Develop reclamation plans with the operator/claimant
- Develop mitigative measures/site specific stipulations
- Require mandatory bonding

- Seek court intervention
  a. Temporary restraining order

  b. Injunction from further activity
- Institute fines or civil penalties
- Perform reclamation and go to court to recover costs from the operator/claimant

Appendix E-3, Comparison of Reclamation Requirements and Estimated Costs

Reclamation Requirements				
Proposed Action	**Alternative A**	**Alternative B**	**Alternative C**	**Alternative D**
Grade tails, spread soils over reshaped tailings, reseed and/or fertilize, re-establish stream channel	Grade tails, stabilize soils, stabilize streams,	Grade tails, spread soils over reshaped tailings, stabilize stream bypass	Grade tails, spread soils over reshaped tailings, reseed and/or fertilize, re-establish stream channel	No mining; pre-1981 unreclaimed; post 1981 to follow Alt. A standards
Cost Per Acre in 1987 Dollars				
Proposed Action	**Alternative A**	**Alternative B**	**Alternative C**	**Alternative D**
\$500-tailings \$500-soils \$250-fertilizer \$100-seed \$350-stream	\$500-tailings	\$500-tailings \$500-soils	\$500-tailings \$500-soils \$250-fertilizer \$100-seed \$350-stream	\$500-tailings
\$1,700 total	\$500 total	\$1,000 total	\$1,700 total	\$500 total

Appendix E-3. Comparison of reclamation requirements and estimated costs on federal claims. Sources: Reclamation Research Plans for Alaska National Park System Units, 1986; Alaska Department of Natural Resources, Division of Mining; Bureau of Land Management estimates.

Appendix F-1, Regulatory Program of the U.S. Army Corps of Engineers, Alaska District

The U.S. Army Corps of Engineers (Corps) is the federal permitting agency for work proposed in waters and wetlands. Within the State of Alaska, this program is administered by the U.S. Army Engineer District, Alaska.

As its primary regulatory responsibilities, the Corps has jurisdiction over the construction of any structure in or over navigable or tidally influenced waters, the excavation of material from navigable waters, the obstruction or alteration of navigable waters, and the placement of dredged or fill material into waters of the United States, including wetlands.

Work proposed in navigable waters of the United States is subject to Section 10 of the Rivers and Harbors Act of 1899. This Act requires a Department of the Army (DA) permit be obtained prior to performance of any construction or activity that alters the course, current, condition, or navigable capacity of a navigable water.

Work proposed in waters of the United States is subject to the Clean Water Act. Section 301 of the Act requires that a DA permit be obtained prior to the placement of dredged or fill material into waters, including wetlands. Permit specifications are identified in Section 404.

Within the Beaver Creek drainage, no navigable waters subject to Section 10 of the Rivers and Harbors Act of 1899 are present. However, extensive areas subject to Section 404 of the Clean Water Act are present.

The regulations implementing the Corps' permit program are found at 33 CFR 320 et seq. As identified in the regulations the Corps' mandate is to consider the public interest when determining whether proposed work should be authorized. No work shall be permitted unless it is found to be in the public interest. Further, waters of the United States and a regulated activity are not restricted by land ownership. A Corps permit may be required for work proposed on private land as well as for work proposed on public land.

If a proposed project is located in an area subject to Corps jurisdiction and requires issuance of a permit, a formal application must be submitted. A public notice describing the proposed work would be prepared and issued to other federal, State, and local agencies and to members of the public for review and comment. If the project is controversial, a public hearing may also be held. In addition to review of the proposed project by other agencies and individuals, the Corps conducts its own public interest review.

The decision whether to issue a permit will be based on an evaluation of the probable impacts, including the cumulative impacts, of the proposed activity and its intended use on the public interest. The benefits which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal must be considered including the cumulative effects thereof. Among the factors considered are conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, land use, navigation, safety, and the needs and welfare of the people among others.

As a result of the public interest review, proposed work may be authorized, denied, or issued with special conditions. Additionally, an applicant may be requested to modify potentially detrimental aspects of the proposed work to comply with the intent of the Clean Water Act or to other laws that apply to the review process. A schematic presentation of the Corps' permit application review process is shown in Figure F-1.

In addition to issuance of individual permits, proposed work may also be issued by existing Nationwide permits found in the Corps regulations, by General Permit (GP), or by Abbreviated Processing Procedures (APP). In its review of proposed placer mining work, the Alaska District is presently identifying those projects not subject to Corps authority, those projects subject to Corps authority and authorized under Nationwide Permit, and those projects suitable for review under individual permit application review procedures. A GP for placer mining is also being considered and may be in

use by late spring, 1988. In addition, an APP is being developed but is not anticipated to be in effect for the 1988 mining season. Once in place, however, those projects meeting the terms and conditions of either procedure could receive expedited processing.

Though not considered to be an inclusive list, many of the activities associated with placer mining subject to Corps authority are identified below. Additional information on work subject to Corps authority may be found in the Corps' regulations.

For the Corps, preparation of BLM's EISs will provide analysis and documentation from which future Corps authorization of work proposed in the areas subject to the EIS would be tiered. Under individual permit application review procedures, project specific environmental assessments may be tiered from each EIS. In addition to the analysis and discussion of anticipated impacts contained in each EIS, the particular circumstances of each project, including analysis of site-specific impacts, would be included in the environmental assessment prepared for each project. Second, development of GPs for work proposed in areas subject to EIS preparation could be tiered from each EIS. Third, APP could be tiered from the subject EISs.

For projects being reviewed under individual permit application review procedures or under APP, the Corps will also evaluate each project under the Section 404(b)(1) Guidelines prepared jointly by the Corps and the EPA (40 CFR Part 230). In addition to determining whether the proposed work meets standards established by the Guidelines, the Section 404(b)(1) analysis includes a review of project alternatives in an effort to avoid or minimize anticipated adverse impacts to aquatic values. For works authorized under a GP, a Section 404(b)(1) analysis would be prepared for all work anticipated to be authorized under each GP. Section 404(b)(1) analysis of each project would not be prepared.

The Corps' Regulatory Branch will assist any individual, agency, company, or corporation in determining whether issuance of a permit for proposed work is required. More detailed information concerning the Corps regulatory program, including information concerning the regulation of activities associated with placer mining, may be obtained by writing to the Corps at the following address:

Regulatory Branch
Alaska District
U.S. Army Corps of Engineers
P.O. Box 898
Anchorage, Alaska 99506-0898
or by telephoning (907) 753-2712 or toll free at (800) 478-2712.

Activities Subject to Section 404 of the Clean Water Act

The following activities associated with placer mining are subject to Section 404 of the Clean Water Act when performed in waters of the United States, including wetlands:

1. the stockpiling of overburden;

2. the stockpiling of placer bearing material prior to processing;

3. the placement of dredged and/or fill material associated with work such as stream diversions, reservoirs, impoundments, and fish bypass channels; and dams, dikes, and berms related to water diversion, collection, and/or retention;

4. the placement of dredged and/or fill material associated with construction of roads, i.e., roads accessing the mine as well as roads located within the mined area(s). NOTE: Nationwide Permit Number 14 may apply for minor stream crossings;

5. the placement of dredged and/or fill material associated with the construction of settling basins, including the construction of access roads, berms, dikes, and similar works;

6. the placement of dredged and/or fill material associated with the excavation of bedrock drains, drainage ditches, and similar works;

7. the placement of dredged and/or fill material associated with the construction of buildings, staging areas, equipment facilities, airstrips, and similar works; and

8. the placement of dredged and/or fill material associated with reclamation.

Activities Subject to Section 10 of the Rivers and Harbors Act of 1899

The following activities associated with placer mining are subject to Section 10 of the Rivers and Harbors Act of 1899 when performed in navigable waters of the United States:

1. all activities listed under work subject to Section 404 of the Clean Water Act above;

2. dredging; and

3. any other activity in, on, or over a navigable water that could affect the course, current, condition, or navigable capacity of a navigable water.

Typical Corps permit review process

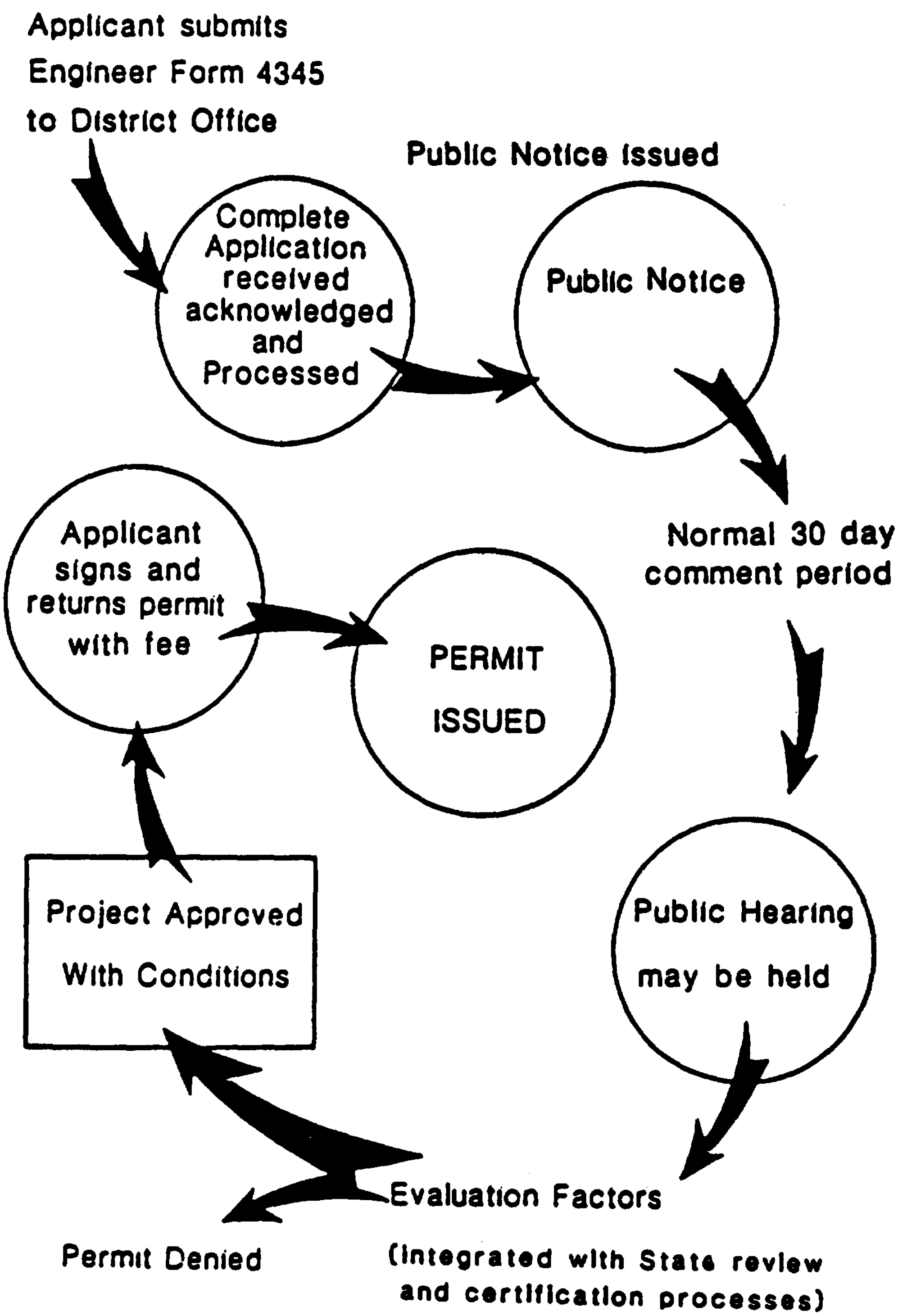


Figure F-1. Permit Review Process.

Bibliography

Alaska Department of Commerce and Economic Development. 1986. The Role of Placer Mining in the Alaska Economy - 1985. Prepared by: L.A. Peterson and Associates. Fairbanks, AK: Office of Mineral Development.

Alaska Department of Environmental Conservation. 1982. Placer Mining Wastewater Settling Pond Demonstration Project. Prepared by: R & M Consultants, Inc. Fairbanks, AK; 120 pages.

Alaska Department of Environmental Conservation. 1985. Alaska Particulates Criteria Review. Prepared by: L.A. Peterson & Associates, Inc. Fairbanks, AK; 245 pages.

Alaska Department of Environmental Conservation. 1986. A Water Use Assessment of Selected Alaska Stream Basins Affected by Placer Gold Mining. Prepared by: Dames & Moore [and others]. Anchorage, AK: Dames & Moore; 179 pages.

Alaska Department of Environmental Conservation. 1987(a). Placer Mining Demonstration Grant Project Design Handbook. Prepared by: L.A. Peterson & Associates, Inc. Fairbanks, AK; 46 pages.

Alaska Department of Environmental Conservation. 1987(b). Alaska Administrative Code; Water Quality Standards; 80 pages. (Chapter 70; 18 A.A.C. 70.010 - 75.900).

Alaska Department of Environmental Conservation. 1987(c). Placer Mining Demonstration Grant Project Final Report. Prepared by: L.A. Peterson & Associates, Inc. Fairbanks, AK; 113 pages.

Alaska Department of Fish and Game. 1976. Alaska Wildlife Management Plans - Interior Alaska. Juneau, AK: Game Division; 200 pages.

Alaska Department of Fish and Game. 1978(a). Alaska's Wildlife and Habitat. Prepared by: McLean and Delaney.

Alaska Department of Fish and Game. 1978(b). Alaska Fishery Atlas : Commercial Fisheries (Vol. I); 33 pages + 152 quads.

Alaska Department of Fish and Game. 1978(c). Alaska Fishery Atlas : Sport Fisheries (Vol. II). Prepared by: McLean and Delaney; 33 pages + 152 quads.

Alaska Department of Fish and Game. 1986(a). Best Management Practices for Placer Mining - Reference Manual and Technical Report. Juneau, AK: Prepared by: L.A. Rundquist [and others]; 2 vols., 459 pages.

Alaska Department of Fish and Game. 1986(b). Alaska Habitat Management Guide for Mammals, Birds, and Human Use. Juneau, AK: Habitat Division.

Alaska Department of Fish and Game. 1986(c). Alaska Area and Community Socioeconomic Profiles. Juneau, AK: Subsistence Division; 306 pages.

Alaska Department of Fish and Game. 1987(a). Effects of Placer Mining on Aquatic Habitat and Fisheries (Final). Fairbanks, AK: Prepared for: U.S. Department of Interior, Bureau of Land Management; 158 pages.

Alaska Department of Fish and Game. 1987(b). Summary of Water Quality and Aquatic Habitat Data, Fortymile, Birch Creek, Tolovana, and Chatanika River Drainages. Prepared for: U.S. Department of Interior, Bureau of Land Management. Fairbanks, AK: Habitat Division; 130 pages.

Alaska Department of Natural Resources. 1987. Annual Placer Mining Application. Fairbanks, AK: Division of Mining; (various applications).

Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys. 1987. Mineral Assessment of the Lime Peak - Mt. Prindle Area, Alaska; Vol.I: Text. Smith, T.E.; G.H. Pessel; and M.A. Wiltse ed. Fairbanks, AK; 712 pages.

Allen, Brian. 1988. Letter in response to Beaver Creek Draft EIS.

Ambrose, Skip. 1988. personal communication. Fairbanks, AK: U.S. Department of Interior, Fish and Wildlife Service.

Arctic Hydrologic Consultants. 1988. The Impact of Placer Mining on Water Quality in Selected Drainage Basins and a Summary of the Methods Available to Reduce Sediment Discharges from Mining (draft). Fairbanks, AK: Prepared for: U.S. Department of Interior, Bureau of Land Management; 22 pages + appendices.

Barney, R.J.. 1969. Interior Alaska Wildfires 1956-1965. Fairbanks, AK: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 47 pages.

Berg, L. 1982. The Effect of Exposure to Short-Term Pulses of Suspended Sediment on the Behaviour of Juvenile Salmonids in: Proceedings of the Cornation Creek Workshop. Nanaimo, British Columbia: Pacific Biological Station; February, 1982; pages 177-196; 404 pages.

Birch Creek villagers. 1987. Comments at 3809 Scoping Meeting. Fairbanks, AK: U.S. Department of Interior, Bureau of Land Management, Arctic District; (notes on file).

Bjerklie, David M.; Jacqueline D. LaPerriere. 1985. Gold-Mining Effects on Stream Hydrology and Water Quality, Circle Quadrangle, Alaska. Water Resources Bulletin - American Water Resources Association; 21(2): 235-243.

Board of Road Commissioners of Alaska. 1912. Annual Report Upon the Construction of Military and Post Roads, Bridges, and Trails; and of Other Roads, Tramways, Ferries, Bridges, Trails and Related Works in the Territory of Alaska. Juneau, AK: Daily Empire Printing.

Board of Road Commissioners of Alaska. 1931. Annual Report Upon the Construction of Military and Post Roads, Bridges, and Trails; and of Other Roads, Tramways, Ferries, Bridges, Trails and Related Works in the Territory of Alaska. Juneau, AK: Daily Empire Printing.

Brooks, Alfred H.. 1905. Placer Mining in Alaska in 1904, Report on Progress of Investigations of Mineral Resources of Alaska in 1904. Washington, D.C.: U.S. Department of Interior, Geological Survey; Bulletin No. 259.

Bundtzen, T.K. [and others]. 1986. Alaska's Mineral Industry, 1985. Fairbanks, AK: Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys; Special Report 39.

Bundtzen, T.K. [and others]. 1987. Alaska's Mineral Industry, 1986. Fairbanks, AK: Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys; Special Report 40; 68 pages.

Carufel, Lou. 1986. [Letter to Ken Miller (land owner/ trapper)].

Caulfield, Richard A. 1983. Subsistence Land Use in the Upper Yukon-Porcupine Communities, Alaska. Fairbanks, AK: Alaska Department of Fish and Game, Subsistence Division; Technical Paper No. 16; 231 pages.

Caulfield, Richard A. [and others]. 1983. Gwich'in Athabaskan Place Names of the Upper Yukon-Porcupine Region: A Preliminary Report. Fairbanks, AK: Alaska Department of Fish and Game, Subsistence Division; Technical Paper No. 83.

Chapman, D.W.; and K.P. McLeod. 1987. Development of Criteria for Fine Sediment in the Northern Rockies Ecoregion: Prepared for: Battelle Columbus Laboratories; EPA Contract No. 68-01-6986.

Colp, Douglas B. 1980. Fortymile Placer District Resource Inventory, Alaska. Washington, D.C.: U.S. Department of Interior, Bureau of Mines; Open File 43-80.

Cook, D.J. 1983. Placer Mining In Alaska. Fairbanks, AK: University of Alaska-Fairbanks, Mineral Industry Research Laboratory; MIRL Report No. 65; 157 pages.

Cook, John P.; and Robert A. McKennan. 1970. The Athapaskan Tradition: A View from Healy Lake in the Yukon-Tanana Upland. paper presented at the: 10th Annual Meeting of the Northeastern Anthropological Association; May, 1970; Ottawa, Canada; 11 pages.

Cox, D.P.; and D.A. Singer (editors). 1986. Mineral Deposit Models. U.S. Department of Interior, Geological Survey; USGS Bulletin 1693; 379 pages.

Crain, E.; and B. Durtsche. 1985. Joint BLM & ADFG Dall Sheep Survey/Inventory. unpublished data: Alaska Department of Fish and Game, Game Division and U.S. Department of Interior, Bureau of Land Management.

Dames and Moore. 1976. Water Quality Data at Selected Active Placer Mines in Alaska: Prepared for: Calspan Corporation.

Dames and Moore. 1988. A General Review of the Effects of Gold Placer Mining Including Site Specific Reviews on Selected Subarctic Alaskan River Basins. Seattle, WA: Prepared for: U.S. Department of Interior, Bureau of Land Management; 57 pages + appendices.

Daubenmire, R. 1968. Plant Communities. New York, NY: Harper and Row, Publishers; 300 pages.

Davis, J.; R. Shideler; and R. LeResche. 1976. Movements and Distribution of the Fortymile Caribou Herd. Juneau, AK: Alaska Department of Fish and Game; Federal Aid Wildlife Restoration Final Project Report; W-17-6 and W-17-7.

Drew, L.J. [and others]. 1986. Quantitative Estimation of Undiscovered Mineral Resources - A Case Study of U.S. Forest Service Wilderness Tracts in the Pacific Mountain System. Economic Geology; 81: 80-88.

Ducker, James H. 1983. Alaska's Upper Yukon Region: A History. Anchorage, AK: U.S. Department of Interior, Bureau of Land Management; 692 pages.

Durst, J.D. 1984. Small Mammals in Relation to Natural Vegetation of Gold Dredge Tailings at Nyac, Alaska: M.S. Thesis; University of Alaska - Fairbanks; 105 pages.

Durtsche, Bruce. 1984(a). Distribution of Caribou in the White Mountains - Interim Report. Fairbanks, AK: U.S. Department of Interior, Bureau of Land Management; 15 pages.

Durtsche, Bruce. 1984(b). Distribution of Dall Sheep in the White Mountains - Preliminary Report. Fairbanks, AK: U.S. Department of Interior, Bureau of Land Management; 14 pages.

Durtsche, Bruce. 1987. Joint BLM and ADF&G Studies of Moose Distribution, Movements, and Habitat Use in Beaver Creek, 1985 -1987. Fairbanks, AK: U.S. Department of Interior, Bureau of Land Management; unpublished data.

Durtsche, Bruce. 1988. personal communication to author. Anchorage, AK: U.S. Department of Interior, Bureau of Land Management.

European Inland Fisheries Advisory Committee. 1965. Water Quality Criteria for European Freshwater Fish: in: Air & Water Pollution. (9:151-168).

Fechner, Steven A.; and Michael D. Balen. 1988. Results of 1987 Bureau of Mines Placer Investigations of the White Mountains Study Area, Alaska. Anchorage, AK: Department of Interior, Bureau of Mines; 158 pages + maps.

Gilluly, James [and others]. 1975. Principles of Geology. San Francisco, CA: W.H. Freeman and Company: page 77.

Haggstrom, D.; and B. Durtsche. 1985-87. Joint BLM & ADF&G Moose Survey/Inventory. unpublished data: Alaska Department of Fish and Game, Game Division and U.S. Department of Interior, Bureau of Land Management.

Hagler, Bailly & Co. 1987; Prepared for: U.S. Department of Interior, Bureau of Land Management. Historical and Economic Analysis of Placer Mining in Interior Alaska (Draft). Fairbanks, AK; 86 pages, and appendices.

Halloran, Jim. 1986. A Study of Natural Revegetation of Placer Tailings: Alaska Department of Natural Resources, Division of Mining; unpublished report; 36 pages.

Heede, Burchard H. 1980. Stream Dynamics: An Overview for Land Managers. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station; General Technical Report RM-72; 26 pages.

Herbert, D.W.M.; and J.C. Merkens. 1961. Effect of Suspended Mineral Solids on the Survival of Trout: in: Air & Water Pollution. (5:46-55).

Holmes, K. 1981. Natural Revegetation of Dredge Tailings at Fox, Alaska. Agroborealis; 13(1): 26-29.

Hulten, Eric. 1968. Flora of Alaska and Neighboring Territories: A Manual of Vascular Plants. Palo Alto, CA: Stanford University Press; 1008 pages; ISBN: 0-8047-0643-3.

Komarek, E.V. 1971. Principles of Fire Ecology and Fire Management in Relation to the Alaskan Environment. in: Proceedings--Fire in the Northern Environment--A Symposium; April 13-14, 1971; Fairbanks, AK. University of Alaska - Fairbanks: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Station; pages 3-22.

Kretsinger, C. 1986. An Investigation of Arctic Grayling Spawning Activity Within the Headwater Tributaries of Beaver Creek: U.S. Department of Interior, Bureau of Land Management, Fairbanks District Office; unpublished report; 6 pages.

LaPerriere, Jacqueline D.; Stephen M. Wagener; and David M. Bjerklie. 1985. Gold-Mining Effects on Heavy Metals in Streams, Circle Quadrangle, Alaska. Water Resources Bulletin - American Water Resources Association; 21(2): 245-252.

Lloyd, Denby S. 1985. Turbidity in Freshwater Habitat of Alaska: A Review of Published and Unpublished Literature Relevant to the Use of Turbidity as a Water Standard. Juneau, AK: Alaska Department of Fish and Game, Habitat Division; Report No. 85-1; 101 pages.

Lotspeich, F.B.; and E.W. Mueller. 1971. Effects of Fire in the Taiga on the Environment. in: Proceedings--Fire in the Northern Environment-- A Symposium; April 13-14, 1971; Fairbanks, AK: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; pages 45-50.

Mack, Stephen F.; and Mary Moorman. 1986. Hydrologic and Water-Quality Investigations Related to the Occurrence of Placer Mining in Interior Alaska, Summers 1984-1985. Fairbanks, AK: Alaska Division of Geological and Geophysical Surveys; Public-Data File 86-16; 138 pages.

Mack, Stephen F.; Mary Moorman; and Linda Harris. 1987. Water Quality and Discharge Data from Selected Sites in the Fortymile and Tolovana Drainages - Summer 1987. Prepared for: U.S. Department of Interior, Bureau of Land Management. Fairbanks, AK: Alaska Division of Geological and Geophysical Surveys; 39 pages.

Mathers, J.S.; N.O. West; and B. Burns. 1981. Aquatic and Wildlife Resources of Seven Yukon Streams Subject to Placer Mining. West Vancouver, British Columbia: Departments of Fisheries and Oceans, Indian and Northern Affairs, and Environment; 183 pages.

McKennan, Robert A. 1969(a). Athapaskan Groups of Central Alaska at the Time of White Contact. in: Ethnohistory; 16(4): 335-343.

McKennan, Robert A. 1969(b). Athapaskan Groupings and Social Organization in Central Alaska: Band Societies. in: Anthropological Series 84, National Museum of Canada; Bulletin 228: pages 93-115.

McLeay, D.J. [and others]. 1983. Effects on Arctic Grayling (Thymallus arcticus) of Short-Term Exposure to Yukon Placer Mining Sediments: Laboratory and Field Studies: Can. Tech. Rep. Fish. Aquat. Sci.; 1171: xvii + 134 pages.

McLeay, D.J.; G.L. Ennis; I.K. Britwell; and G.F. Hartman. 1984. Effects on Arctic Grayling (Thymallus arcticus) of Prolonged Exposure to Yukon Placer Mining Sediment: A Laboratory Study: in: Can. Tech. Rep. Fish. Aquat. Sci.; 1241: xii + 95 pages.

McLeay, D.J.; I.K. Britwell; G.F. Hartman; and G.L. Ennis. 1987. Responses of Arctic Grayling (Thymallus arcticus) to Acute and Prolonged Exposure to Yukon Placer Mining Sediment: in: Can. J. Fish. Aquat. Sci. (44:658-673).

McQuesten, Leroy N. 1977. Life in the Yukon 1871-1885. Dawson, Canada: Yukon Order of Pioneers.

Mertie Jr., J.B. 1937. The Yukon-Tanana Region, Alaska. Washington, D.C.: U.S. Department of Interior, Geological Survey; U.S. Geol. Survey Bulletin 872; 276 pages.

Murray, David F.; and Robert Lipkin. 1987. Candidate Threatened and Endangered Plants with Comments on Other Rare Plants of Alaska. Fairbanks, AK: University of Alaska Museum; 76 pages.

Neiland, B.J. 1978. Rehabilation of Bare Sites in Interior Alaska. in: Agroborealis; 10(1): 21-25.

Nelson, Richard K. 1973. Hunters of the Northern Forest. Chicago, IL: University of Chicago Press.

Noggle, C.C. 1978. Behaviour, Physiological and Lethal Effects of Suspended Sediment on Juvenile Salmonids. M.S. Thesis; University of Washington - Seattle; 87 pages.

Nowlin, R.A. 1987. Unit 25 Moose Survey-Inventory Progress Report. Fairbanks, AK: Alaska Department of Fish and Game; Federal Aid in Wildlife Restoration Progress Report; pages 145 - 150 Project W-22-5, Job 1.0. (Vol. 17, Part 8).

Nowlin, Roy, biologist; 1988. personal communication. Fairbanks, AK: Alaska Department of Fish and Game.

Olson, Wallace M. 1981. Minto, Alaska: in Handbook of North American Indians. Helm, June ed. Washington, D.C.: Smithsonian Institution; vol. 6; Subarctic: pages 704-711.

Osgood, Cornelius. 1936. Contribution to the Ethnology of the Kutchin. New Haven, CT: Yale University Publications; 189 pages + 10 plates.

Pacific Legal Foundation. 1988. Letter in response to Beaver Creek Draft EIS. Anchorage, AK.

Peterson, E.B.; and N.M. Peterson. 1977. Revegetation Applicable to Mining Sites in Northern Canada. Ottawa, Canada: Minister of Indian and Northern Affairs; Environmental Studies No.3; 420 pages.

Pewe, T.L. 1982. Geologic Hazards of the Fairbanks Area, Alaska. College, AK: Alaska Division of Geological and Geophysical Surveys; Special Report 15.

Post, R.A. 1986(a). Field Trip to Nome Creek (Report to Files): Alaska Department of Fish and Game, Habitat Division; June 10 - 11.

Post, R.A. 1986(b). Rehabilitation Alternatives for Mitigating Mining Impacts in the Nome Creek Valley, White Mountains National Recreation Area. Prepared for: U.S. Department of Interior, Bureau of Land Management. Fairbanks, AK: Alaska Department of Fish and Game, Habitat Division; 107 pages.

Post, R.A. 1987. personal communication. Fairbanks, AK: Alaska Department of Fish and Game, Habitat Division.

Reed, R.J. 1964. Life History and Migration Patterns of Arctic Grayling (Thymallus arcticus) in the Tanana River Drainage of Alaska: Alaska Department of Fish and Game; Research Report No. 2.

Rhine, T.D. 1985. Upper Beaver Creek Arctic Grayling Inventory, unpublished report: U.S. Department of Interior, Bureau of Land Management, Fairbanks District Office; 6 pages.

Rutherford, C; and K. Meyer. 1981. Revegetation on Gold Dredge Tailings, Nyac, Alaska. Prepared for: U.S. Department of Interior, Bureau of Land Management. Anchorage, AK: Anchorage District Office; 2 volumes; 61 pages.

Schneider, William. 1976. Beaver, Alaska: The Story of a Multi-Ethnic Community. Unpublished Ph.D. dissertation: Bryn Mawr College, PA.

Selkregg, Lidia L. 1974. Alaska Regional Profiles: Yukon Region. Anchorage, AK: University of Alaska - Fairbanks, Arctic Environment Information and Data Center; 346 pages.

Sherwood, Morgan B. 1965. Exploration of Alaska, 1865-1900. New Haven, CT: Yale University Press.

Shimkin, D.B. 1955. The Economy of a Trapping Center: The Case of Fort Yukon, Alaska. in: Economic Development and Culture Change; 3(3): 219-240.

Simmons, R.C. 1984. Effects of Placer Mining Sedimentation on Arctic Grayling of Interior Alaska. M.S. Thesis: University of Alaska - Fairbanks.

Slaughter, Dale C. no date. Yukon Flats Cultural Resources Survey; 147 pages; unpublished manuscript; Doyon Lands Department, Fairbanks, AK.

Smith, David M.. 1962. The Practice of Silviculture. New York, NY: John Wiley and Sons, Inc.; 578 pages.

Spencer, P. 1987. Field Notes. Anchorage, AK: U.S. Department of Interior, Bureau of Land Management; unpublished data.

State of Alaska. 1988. Letter in response to Beaver Creek Draft EIS. Juneau, AK: Division of Governmental Coordination, Office of the Governor.

Sumida, Valerie; and Clarence Alexander. 1985. Moose Hunting by Residents of Beaver Creek, Birch Creek, Fort Yukon, and Stevens Village in the Western GMU 25(D) Permit Moose Hunt Area 1984-1985. Fairbanks, AK: Alaska Department of Fish and Game; Technical Report No. 121; 21 pages.

U.S. Army Corps of Engineers, Alaska District. 1988. Letter to Dick Dworsky (EIS Project Manager) from Larry Reeder (Chief, Special Actions Section, Regulatory Branch); 3 pages.

U.S. Department of Agriculture, Soil Conservation Service. 1979. Exploratory Soil Survey of Alaska.

U.S. Department of Commerce, Weather Bureau. 1963. Probable Maximum Precipitation and Rainfall Frequency Data for Alaska. Washington, D.C.; Technical Paper No. 47; 69 pages.

U.S. Department of Interior, Bureau of Land Management. 1979. Bureau Manual 6740: Wetland-Riparian Area Protection and Management. Washington, D.C.; Rel. 6-69; 20 pages.

U.S. Department of Interior, Bureau of Land Management. 1980. Final Environmental Impact Statement; Surface Management of Public Lands Under the U.S. Mining Laws 43 CFR 3809. Washington, D.C.; 134 pages.

U.S. Department of Interior, Bureau of Land Management. 1983(a). Fortymile River - River Management Plan. Fairbanks, AK; 90 pages.

U.S. Department of Interior, Bureau of Land Management. 1983(b). Beaver Creek - River Management Plan. Fairbanks, AK; 57 pages.

U.S. Department of Interior, Bureau of Land Management. 1984. Proposed Resource Management Plan/Final Environmental Impact Statement for the White Mountains National Recreation Area. Fairbanks, AK; 317 pages.

U.S. Department of Interior, Bureau of Land Management. 1985(a). BLM Manual - Section 3809 Surface Management; Rel. 3-118.

U.S. Department of Interior, Bureau of Land Management. 1986(a). Surface Management - BLM Alaska State Handbook Supplement. Anchorage, AK; H-3809-1; 100 pages.

U.S. Department of Interior, Bureau of Land Management. 1986(b). Record of Decision Resource Management Plan for the White Mountains National Recreation Area. Fairbanks, AK; BLM-AK-PT-86-017-1619-028; 41 pages.

U.S. Department of Interior, Bureau of Land Management. 1986(c). 3809 Compliance Inspection Sheet. Anchorage, AK; (various forms).

U.S. Department of Interior, Bureau of Land Management. 1987(a). Notice of Intent for EIS on Placer Mining Activities, Alaska: Federal Register; August 18; 52(159): 30961-30962.

U.S. Department of Interior, Bureau of Land Management. 1987(b). 3809 Compliance Inspection Sheet. Anchorage, AK; (various forms).

U.S. Department of Interior, Bureau of Land Management. 1987(c). Water Rights Assessment for Beaver Creek National Wild River, Alaska. Van Haveren, Bruce P. [and others]. Lakewood, CO: BLM Denver Service Center; BLM/YA/PT-87/014+7200; 215 pages.

U.S. Department of Interior, Bureau of Land Management. 1987(d). Native Allotment Records. available from Steese/White Mountain District Office, Fairbanks, AK.

U.S. Department of Interior, Bureau of Land Management. 1987(e). Surface Disturbing Activities in Alaska: A Guide to Technical Aspects of Mitigation and Reclamation. Anchorage, AK; AK-BLM-PT-87-008-1610-933; 159 pages.

U.S. Department of Interior, Bureau of Land Management. 1987(f). Draft Environmental Impact Statement for the Proposed Trans-Alaska Gas System. Anchorage, AK: Prepared with: U.S. Army Corps of Engineers.

U.S. Department of Interior, Bureau of Land Management. 1988(a). White Mountains National Recreation Area - Recreation Activity Management Plan. Fairbanks, AK: Steese/White Mountains District Office; 18 pages.

U.S. Department of Interior, Bureau of Land Management. 1988(b). Environmental Assessment - John E. McLain, d.b.a. The Mining Company. Fairbanks, AK: Steese White Mountains District Office; EA-AK-080-88-001; 24 pages + appendices.

U.S. Department of Interior, Bureau of Land Management. 1988(c). Environmental Assessment - Alaska Placer Development, Inc. Fairbanks, AK: Kobuk District Office; EA-AK-070-004; 20 pages + appendices.

U.S. Department of Interior, Bureau of Land Management. Recreation Management Information System; 1984-1987; unpublished data.

U.S. Department of Interior, Bureau of Mines. 1987. Cost Estimation Handbook for Small Placer Mines. Prepared by: Scott A. Stebbins. Washington, D.C.; Bureau of Mines Information Circular 9170; 94 pages.

U.S. Department of Interior, Bureau of Outdoor Recreation. 1974. Beaver Creek National Wild River, Alaska - Final Environmental Statement; 400 pages.

U.S. Department of Interior, Fish and Wildlife Service. 1964. A Report on Fish and Wildlife Resources Affected by Rampart Canyon Dam and Reservoir Project, Yukon River, Alaska. Juneau, AK.

U.S. Department of Interior, Fish and Wildlife Service. 1982. Recovery Plan for the Peregrine Falcon-Alaskan Population; 69 pages.

U.S. Department of Interior, Fish and Wildlife Service. 1988. Letter in response to Beaver Creek Draft EIS. Fairbanks, AK: Northern Alaska Ecological Services; 9 pages.

U.S. Department of Interior, Geological Survey. 1983. Alaska Mineral Resources Appraisal Program : Circle Quadrangle; USGS Open-File Report 83-170-A,B,C.

U.S. Department of Interior, Geological Survey. 1987(a). Administrative Report on the Mineral Resource Assessment for Part of the White Mountains National Recreation Area, Alaska, Prepared for: U.S. Department of Interior, Bureau of Land Management. Anchorage, AK; Unpublished report; 130 pages.

U.S. Department of Interior, Geological Survey. 1987(b). The Alaska Mineral Resource Assessment Program: Background Information to Accompany Folio of Geologic and Mineral Resource Maps of the Circle Quadrangle, Alaska.

U.S. Department of Interior, National Park Service. 1986. Reclamation Research Plans for Alaska National Park Systems Units. Prepared by, Reagan, Douglas P.; Braun, Constance V. Anchorage, AK: Environmental Science and Engineering, Inc.; NPS Contract No. CX-0001-4-0072; 95 pages.

U.S. Department of Interior, National Park Service. 1988. Scoping and Alternatives Brochure; 1 page.

U.S. Environmental Protection Agency. 1973. Methods for Identifying and Evaluating the Nature and Extent of Non-Point Sources of Pollutants. Washington, D.C.: Office of Air and Water Programs; EPA-43019-73-014; 225 pages.

U.S. Environmental Protection Agency. 1983. Water Quality Standards Handbook. Washington, D.C.: Office of Water Regulations and Standards; 225 pages.

U.S. Environmental Protection Agency. 1987(a). Federal Register; March 24; 52(56): 9414-9434.

U.S. Environmental Protection Agency. 1987(b). Economic Impact Analysis of Effluent Limitations and Standards for the Notice of Data Availability for the Placer Gold Mining Industry. Washington, D.C.: Office of Water Quality Regulations and Standards.

U.S. Water Resources Council. 1979. Procedures for Evaluation of National Economic Development (NED) Benefits and Costs in Water Resources Planning. Washington, D.C.: in: Federal Register 44(242):950-965.

U.S. Water Resources Council. 1980. Reference Handbook: For Use With Principles, Standards and Procedures for Water Resources Planning. Washington, D.C.

U.S. Water Resources Council. 1983. Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. Washington, D.C.

Valkenburg, P; and J. Davis. 1988. Personal communication; Alaska Department of Fish and Game, Game Division (research).

Van Nieuwenhuyse, Erwin E.; and Jacqueline D. LaPerriere. 1986. Effects of Placer Gold Mining on Primary Production in Subarctic Streams of Alaska. Water Resources Bulletin - American Water Resources Association; 22(1): 91-99.

Viereck, L.A.; C.T. Dyrness; and A.R. Batten. 1986. The 1986 Revision of the Alaska Vegetation Classification. Fairbanks, AK: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 195 pages.

Viereck, L.A.; C.T. Dyrness; and A.R. Batten. 1987. Alaska Vegetation Classification Systems, Forest Section. Fairbanks, AK: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 111 pages.

Vogler, D. 1988. personal communication. Fairbanks, AK: U.S. Department of Interior, Bureau of Land Management.

Vogler, D. 1988. personal observation. Fairbanks, AK: U.S. Department of Interior, Bureau of Land Management.

Wagener, Stephen M.; and Jacqueline D. LaPerriere. 1985. Effects of Placer Mining on the Invertebrate Communities of Interior Alaska Streams. Freshwater Invertebrate Biology; 4(4): 208-214.

Webb, Joe. 1982. Field Survey Notes; U.S. Department of Interior, Bureau of Land Management; unpublished data.

Webb, Joe. 1983. Field Survey Notes; U.S. Department of Interior, Bureau of Land Management; unpublished data.

Webb, Joe. 1984. Field Survey Notes; U.S. Department of Interior, Bureau of Land Management; unpublished data.

Webb, Joe. 1985. Field Survey Notes; U.S. Department of Interior, Bureau of Land Management; unpublished data.

Webb, Joe. 1986. Field Survey Notes; U.S. Department of Interior, Bureau of Land Management; unpublished data.

Webb, Joe. 1987. Field Survey Notes; U.S. Department of Interior, Bureau of Land Management; unpublished data.

Weber, Phyllis K.; and Roger Post. 1985. Aquatic Habitat Assessments in Mined and Unmined Portions of the Birch Creek Watershed. Juneau, AK: Alaska Department of Fish and Game, Habitat Division; Tech. Report no. 85-2; 65 pages.

West, Frederick H. 1981. The Archaeology of Beringia. New York, NY: Columbia University Press.

Will, Susan M. 1986. Beaver Creek National Wild River Cultural Resources Inventory. Fairbanks, AK: U.S. Department of Interior, Bureau of Land Management; Open-File Report 19; 47 pages.

Williams, J.R. 1970. Ground Water in the Permafrost Regions of Alaska. Washington, D.C.: U.S. Department of Interior, Geological Survey; USGS Prof. Paper 696; 83 pages.

Winter, J. 1987, Habitat Biologist; Alaska Department of Fish and Game, Habitat Division.

Wolff, Ernest N.; and Bruce I. Thomas. 1982. The Effects of Placer Mining on the Environment in Central Alaska. Fairbanks, AK: Mineral Industry Research Laboratory, University of Alaska; MIRL Report No. 48; 64 pages.

Glossary

Active Mining Claim: A current BLM mining claim in which all assessment and other requirements have been met, although no active mining may be taking place.

Alevius: A newly hatched salmon with yolk sac still attached.

Allochthonous: Formed elsewhere and transported from a distance.

Alluvial fan: A low, outspread mass of loose rock material shaped like an open fan deposited by a stream at the place where it issues.

Alluvium: Deposits laid down by modern rivers and streams.

Anadromous: Aquatic organism migrating from marine waters to freshwater to spawn.

Alteration Zone: An area being modified or changed in any noticeable way.

Aquifer: A body of rock that is sufficiently permeable to convey ground water and to yield economically significant quantities of water to wells and springs.

Areal: A multi-leveled or spatial relationship between two or more resources.

Aspect: A particular status or phase in which something appears or may be regarded.

Association: In an abstract sense, a group of communities or stands that are classified together because they meet certain standards of similarity.

Aufesis: An ice feature formed by water overflowing onto a surface, such as river ice or gravel deposits, and freezing.

Batholith: A large plutonic mass that has more than 40 square miles of surface exposure and no known floor.

Benthic: Relating to or occurring at the bottom of a water body.

Biomass: Amount of living matter as in a unit area or volume of matter.

Biotite: A general term to designate all iron and magnesium- bearing micas.

Braided Stream: A stream flowing in several dividing and reuniting channels resembling the strands of a braid. Typically within a wide floodplain.

Bryophytes: Non-flowering plants comprising of the mosses and liverworts.

Burin: A steel tool with an oblique point and rounded handle for carving stone, or a prehistoric chisel-like flint tool.

Candidate Species: Those species (plant or animal) included in the Federal Register "Notice of Review" listing that are being considered by the FWS for listing as threatened or endangered species.

Chaining: Cultivating implement used to spread and distribute debris; usually devised of link chains.

Channelize: A non-natural rerouting of a stream course.

Cirque: A deep, steep-walled, half-bowl-like recess situated high on the side of a mountain and commonly at the head of a glacial valley and produced by the erosive activity of a mountain glacier.

Classification: Separation of materials by size.

Clay: Sediment particles between 0.002 and 0.004 mm in equivalent spherical diameter.

Climax: A more or less stable biotic community which is in equilibrium with existing environmental conditions and which represents the terminal stage of an ecological succession.

Coagulation: A chemical process that reduces turbidity in a water body.

Code of Federal Regulations (CFR): Regulations promulgated and enforced by federal agencies which have the full force of law.

Coliforms: Relating to, resembling, or being a bacilli that resides in vertebrate intestines.

Colluvial: Soil material, rock fragments, or both, which have been deposited at the base of a steep slope by creep, slide, or local wash.

Comminute: To reduce to minute particles or pulverize.

Community: Any group of organisms belonging to a number of different species that co-occur in the same habitat or area and interact through trophic and spatial relationships, typically characterized by reference to one or more dominant species.

Critical Viewsheds: A unit within a National Wild River that has special considerations.

Crown Fire: A fire that burns mainly the top foliage of trees or shrubs.

Crucial Habitat/Crucial Use Area: Wildlife use area(s) which are necessary for perpetuation of the species or population and which provide an essential element of the life cycle for that species or population.

Crustose: Having a thin thallus, adhering closely to a substratum of rock, bark, or soils.

Cryofibrist: An organic soil material (peat) formed under cold conditions.

Cryogenic: A soil formed under cold conditions, literally "cold genesis."

Cumulative Effects or Impacts: The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

D2: Refers to Section 17(d)2 of the Alaska Native Claims Settlement Act (40 CFR 1508.7).

Deciduous: To fall off or shed annually, seasonally, or at a certain stage in the life cycle.

Dendritic: A stream pattern characterized by irregular branching in all directions.

Detritus: Material released by weathering processes and subsequently transported and deposited as sediments.

Dike: A tabular igneous intrusion that ducts across the structure of the surrounding rock.

Disclimax: An ecological succession maintained below climax by climatic instability, fire, grazing, or by the activities of man.

Ecosystem: The Community including all the component organisms together with the abiotic environment, forming an interacting system, e.g., a marsh.

Ecotone: The boundary or transitional zone between adjacent communities or biomes.

Endemic: Native to or restrictive towards a particular type of habitat, locality, or region.

Environmental Assessment: This document is prepared for actions not exempt from NEPA, not categorically excluded, not adequately covered in an existing RMP/EIS or other environmental analysis, and not normally or obviously requiring an EIS.

Ericaceous: Refers to the heath family of plants. Heaths are dwarf woody shrubs, including such species as blueberries, cranberries, mossberries, etc.

Federal Land Policy and Management Act (FLPMA): BLM's "organic act" which serves as the basic law providing direction for lands and minerals management under its jurisdiction.

Federal Register: A publication system used to inform the public of Federal regulations, proposed regulations, and to provide for the publication of agency statements of organization, procedural rules, and general policy.

Felsic: An igneous rock containing light minerals such as quartz, feldspars, feldspathoids and muscovite.

Fingerling: A fish up to one year of age; between the fry and smolt stage.

Fines: The smaller-grained particles of soil or gravel, usually consisting of fine sand, silt, and clay.

Flaggy: A soil characterized by coarse rock fragments that are flat, thin, and angular, with dimensions of six to 15 inches.

Flocculation: A chemical process that causes clay particles to stick together, making them settle out faster and reduce turbidity.

Fluvial: Produced by river or other stream action.

Foliose Lichens: Lichens having a flat, thin, and usually lobed thallos attached to a foundation.

Forb: Any herbaceous plant which is not a grass or sedge.

43 CFR 3809: Regulations which set forth policies and procedures providing for mineral entry, exploration, location, operations and purchase pursuant to the mining laws in a manner that will not unduly hinder such activities, but will assure that these activities are conducted in a manner that will prevent unnecessary or undue degradation and provide protection of non- mineral resources of the Federal lands.

404 Permit: The 404 guidelines are the substantive criteria used in evaluating discharge of dredged or fill material under Section 404 of the Clean Water Act.

Freshet: A great rise or overflowing of a stream due to heavy rains or melting snow.

Frost Boil: A small area of upward movement of soil or inorganic material caused by the freezing and thawing of free water in the soil.

Fruiticose: More or less shrub-like.

Fry: A recently hatched fish that has used up the yolk cas, and has emerged from gravel and is ready to feed.

Gel Log: A chemical treatment that settles out suspended solids from effluent water before releasing it into a stream.

General Mining Law of 1872: Provides for exploration, development, production, and purchase of mineral resources of the public lands, as well as the implied right of statutory access to mining claims.

Giardia: Infestation or disease caused by a flagellate protozoan.

Graminoid: Refers to an herb with long, narrow leaves, i.e., grasses and sedges.

Gravimetric: Analysis which pertains to a measurement by weight.

Harrow: A cultivating implement with spikes, spring teeth, or discs, and used primarily for smoothing and distributing soil.

Herb: A plant with one or more stems that die back to the ground each year; grasses and Forbs as distinct from shrubs and trees.

Hydrology: The study of the origin, distribution, and properties of water on or near the surface of the earth.

Hydrostatic Pressure: Pressure exerted or transmitted by fluids at rest.

Ice wedge: Wedge-shaped ground ice produced in permafrost, occurring as a sheet, dike, or vein tapering downward. It originates as the growth of frost or by the freezing of water in a narrow crack or fissure.

Invasion: The Migration and Establishment of an organism in a new location.

Karsting: An irregular limestone region with sinks, underground streams, and caverns.

Lacustrine: Pertaining to, produced by, or formed in a lake or lakes.

Landcover: The vegetated, non-vegetated (barren), and sparsely vegetated components of a terrestrial area. Usually includes surface water, gravel, bare rock, and all types of vegetative cover.

Legume: A plant belonging to the pea family (Leguminosae).

Listed Threatened and Endangered Species: A species (plant or animal) that is officially recognized by FWS as being threatened or endangered.

Lithic: A medium-grained sedimentary rock containing abundant fragments of previously formed rocks; also said of such fragments.

Loam: Soil material that is seven to 27% clay particles, 26 to 50% percent silt particles and less than 52% percent sand particles.

Lode: A vein containing important quantities of metallic ore and filling a well-defined fissure in the rock.

Mafic: Igneous rock composed chiefly of one or more dark iron and magnesium-bearing minerals.

Management Framework Plan: A planning decision document prepared before the effective date of regulations implementing land use planning provisions of FLPMA which provides interim management until replaced by the RMP.

Massif: A principal mountain mass.

Management Goal: Goals that have been developed through the planning processes of BLM and other agencies for the watersheds being considered.

Master Title Plats: Maps displaying lands status of lands managed by the federal government.

Megafauna: Living or fossil animals large enough to be seen with the naked eye.

Metasedimentary: Sediment or sedimentary rock that shows evidence of being subjected to physical and chemical conditions below the earth's surface.

Mineral Soil: Soil composed mainly of inorganic materials and with only a relatively low amount of organic material.

Mining Technique: Methods used by miners to operate their mine. This includes activities such as exploration, access, development, mineral extraction, and reclamation.

Moraine: 1. Solidified volcanic debris carried on the surface of a lava flow. 2. A mound, ridge or other distinct accumulation of glacial drift deposited chiefly by direct action of glacial ice.

Morphology: A branch of biology or paleontology that deals with the form and structure of animals and plants, or their fossil remains.

Motorized Recreation: A leisure activity in which merely operating the vehicle constitutes the activity, i.e., operating the vehicle is an end in itself (such as snow machining or motorcycle trail riding), or in which use of a motor vehicle is customarily an integral part of the activity, such as recreational gold panning, sightseeing, or vehicle-based camping.

National Environmental Policy Act (NEPA): This Act establishes a national policy for the protection and enhancement of the environment. Federal agencies are directed to develop methods and procedures that ensure the unquantified environmental values are given appropriate consideration in decisionmaking as are economic and technical considerations.

National Recreation Area: A federally managed area which involves the protection, regulated use, and development of public lands for recreational enjoyment.

Native: Indigenous; living naturally within a given area; used of a plant species that occurs at least partly in natural habitats and is consistently associated with certain other species in these habitats.

Non-Motorized Recreation: A leisure activity that is engaged in without the aid of motorized transportation, except to provide initial access. The motor vehicle is left behind and returned to only at the conclusion of the activity, such as hiking, horseback riding, or floatboating.

Non-Point Source: All turbidity, suspended sediment, and sedimentation resulting from soil erosion caused by human activity and emanating from a widespread area.

Notice: A Notice must be filed by all mining operators whose operations, including access across federal lands to their claim, cause a cumulative surface disturbance of five acres or less during any calendar year.

Notice of Intent: A public notice stating that an environmental impact statement will be prepared and considered.

Orographic: Relating to mountains, ie., precipitation caused by uplift of an air mass over a mountain range.

Oxbow Lakes: Remaining lakes that were once a part of a river channel, but are now isolated from the main stream. Most resemble a bent or U-type configuration.

Peltic: 1. Pertaining to or characteristic of pelite, a sedimentary rock composed of clay and minute particles of quartz 2. A metamorphic rock derived from a pelite.

Physiography: Relating to the form of the earth or its surface features, e.g. topography.

Peraluminous: A type of igneous rock in which the molecular proportion of alumina exceeds that of soda, potash, and lime combined.

Performance Standards: A measurable quantity used to define the limits of allowable environmental impacts resulting from mining and related activities.

pH: The hydrogen-ion activity of a solution, which is an indication of the solution's acidity or basicity.

Physiography: Relating to the form of the earth or its surface features, e.g., topography.

Plan of Operations: This plan is required for mining operations disturbing five surface acres or more, and any operation except casual use in areas designated for potential addition to, or an actual part of the Wild and Scenic Rivers System, and designated areas of Critical Environment Concern, the National Wilderness Preservation System administered by BLM, and areas closed to off-road vehicle use.

Pluton: An igneous intrusion or rock mass formed within surrounding rock of another type.

Primary Succession: Succession beginning on a bare area, not previously occupied by plants or animals.

Propagule: Any part of an organism, produced sexually or asexually, that is capable of giving rise to a new individual.

Proposed Action: Any resource use or development or management action proposed by the Bureau, or to the Bureau by a member of the public, or by another agency through any appropriately developed procedures including, in the case of non-Bureau proposals, nominations, petitions, and applications.

Record of Decision: A brief statement which completes the associated EIS and, among other things, indicates which alternative, or combination of alternatives has been approved.

Recorded: The filing of paperwork with the State and BLM to make a mining claim properly of record.

Recycle: The use of water from one of the settling ponds for the sluicing period. In 100% recycle, all process water used in sluicing is obtained from the settling ponds.

Resource Management Plan: A land use plan as prescribed by the Federal Land Policy and Management Act which establishes: 1) the level and intensity of land use, 2) allowable resource uses and related levels of production or use, 3) resource condition goals and objectives, 4) program constraints and general management practices needed to achieve the above, 5) the need for an area to be covered by more detailed and specific plans, 6) support action to achieve the above, 7) general implementation sequences, and 8) intervals and standards for monitoring and evaluating the plan. It is not a final implementation decision on actions which require further specific plans, process steps, or decisions under specific provisions of law and regulations.

Riparian: Refers to land bordering a stream, lake, or tidewater.

Scarify: See harrow or chaining.

Scoping: The act of holding organized meetings to address significant issues that are of particular concern to individuals or groups.

Section 810: Section within ANILCA mandating that subsistence uses and needs are to be considered in federal land use decisions.

Sedge: A rush-like or grass-like plant that grows in wet places.

Sere: The series of stages that follow one another in an ecologic succession.

Serotinous: Refers to late opening, such as cones of black spruce trees which remain on the trees for several years without opening. Allows cones to survive fires, and provide seed source after fire.

Settling Pond: A pond, usually artificially constructed of tailings, designed to remove sediment from water by simple settling.

Settleable Solids: The volume of matter in water that will settle in one hour under quiescent conditions in an Imhoff cone.

Sierra Club Lawsuit: The series of orders and injunctions arising from the Sierra Club's action that resulted in this EIS.

Significance: A high degree of importance as indicated by either quantitative measurements or qualitative judgments. Significant issues and impacts require explicit consideration in preparing a plan. Significance may be determined by evaluating characteristics pertaining to location, extent, consequences, and duration. As used in the National Environmental Policy Act, "significance" requires consideration of both context and intensity. (see 40 CFR 1508.17)

Significant Restriction to Subsistence Uses and Needs: BLM policy states that a "significant restriction to subsistence uses and needs" could occur if there is: 1) a reduction in harvestable resources used for subsistence purposes, 2) there is a reduction in the availability of resources caused by an alteration in their distribution, migration, or location, or 3) a limitation on the access of subsistence users to harvestable resources. Generally, only the prediction of large or substantial effects as opposed to slight effects in one or more of these three categories would result in a section 810 evaluation of significant restriction to subsistence uses and needs.

Sill: A tabular igneous intrusion that parallels the structure of the surrounding rock.

Silt: Sediment particles between 0.004 and 0.0625 mm in equivalent spherical diameter; coarse mud.

Skarn: An old Swedish mining term for silicate waste rock with certain iron-ore and sulfide deposits.

Sluice: To mine or wash with water. Also used synonomously with sluicebox.

Sluicebox: The rectangular shaped launder, containing riffles, that is used as a gold recovery system in placer mining.

Solifluction Lobe: A mass of soil material which, because of water saturation, has formed a small terrace through the slow, mass movement of the soil blanket downslope.

Special Area: Those geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important or easily disrupted ecological values.

Stocks: An igneous intrusion that is smaller than a batholith and more or less circular in shape.

Stone Stripe: A form of patterned ground consisting of a line of rocks or other inorganic material parallel to the slope of the ground, caused by the freeze - thaw cycle and the effects of gravity.

Stratigraphy: The science or arrangement of rock strata.

Stream Bypass: A channel constructed to divert an active stream channel around a mining operation, so to avoid direct stream contact.

Strike-slip fault: A fault on which the movement parallel to the fault's strike.

Subsistence Uses: Section 803 of ANILCA defines the term "subsistence uses" to mean "...the customary and traditional uses by rural Alaskan residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible by-products of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade." For the purposes of this definition, 1) "family" means all persons related by blood, marriage, or adoption, or any person living within the household on a permanent basis; and 2) "barter" means the exchange of fish or wildlife or their parts, taken for subsistence uses - (a) for other fish or game or their parts; or (b) for other food or for nonedible items other than money if the exchange is of a limited and noncommercial nature.

Succession: The replacement of one kind of community by another kind; the progressive changes in vegetation and in animal life which may culminate in the climax.

Sucker: In many plants, a shoot arising from the lower parts of the stem or from the root.

Suite: A collection of rock specimens from a single area, generally representing related igneous rocks.

Taiga: A swampy area of coniferous forest.

Tailings: Waste material processed through a placer operation usually consisting of coarse sand and larger particles.

Taxonomic: The study of the general principles of orderly scientific classification, usually according to their presumed natural characteristics.

Terrane: A rock or group of rocks and the area in which they crop out.

Thrust fault: A fault with a dip of 45° or less over much of its extent, on which the hanging wall appears to have moved upward relative to the footwall. Horizontal compression rather than vertical displacement is its characteristic feature.

Tiering: An interrelationship in which reference to a more general NEPA document such as an EIS can be made by a more specific one, thus avoiding duplication. Designed to focus on the actual issues ripe for decision at each level of environmental review.

Topsoil: The upper soil layer or layers containing some organic matter.

Tailrace: A channel in which mine tailings are carried away.

Tundra: The treeless land in arctic and alpine regions, varying from bare area to various types of vegetation consisting of grasses, sedges, forbs, dwarf shrubs, mosses, and lichens.

Turbidity: The condition of a body of water that contains suspended material such as clay or silt particles, dead organisms or their parts, or small living plants and animals.

Tussock: A dense, heavy tuft or matted growth of grass or sedge which forms a small hillock.

Type: A kind of vegetation, e.g., community-type, forest type, birch type.

Unnecessary or Undue Degradation: This is surface disturbance greater than what would normally result under a prudent operator in usual, customary, and proficient operations of similar character. Effects of operations on other resources and land uses, including resources and uses outside the area of operations are also considered.

Vegetation Type: A kind of vegetation or the kind of community of any size, rank, or stage of succession.

Vegetative Reproduction: Reproduction by asexual processes.

Visitor Use Day: Equal to 12 hours spent by one person in the pursuit of recreation. Can be any combination of people and time that equals 12 person/hours. For example, three people for four hours, or two people for six hours, both equal one visitor use day.

Visual Resource Management (VRM): Utilized to classify landscapes and visual characteristics. Classification I has a higher value than II and III.

Volatile Organics: Carbon-based line matter that is highly vulnerable to disruption.

Watershed: A region or area bounded peripherally by water, parting and draining ultimately to a particular watercourse or body of water.

Wetland: An area of low-lying land, submerged or inundated periodically by fresh or saline water.

Wild River: Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive, and waters unpolluted.

Windlass: A device for hauling or hoisting.

Zero Discharge: A water treatment techniques where there is no release of water back into a stream either through a pipe, an overflow or by visible seepage through a dam or tailings filter. Underground flow is considered a discharge if the water quality in the stream is measurably impacted.

Acronyms

ACEC........Area of Critical Environmental Concern

ADGGS.....Alaska Department of Geological and Geophysical Surveys

ADFG........Alaska Department of Fish and Game

ADNR........Alaska Department of Natural Resources

AHC...........Arctic Hydrologic Consultants

AHRS........Alaska Heritage Resources Survey

ANILCA....Alaska National Interest Lands Conservation Act

BLM..........Bureau of Land Management

CEQ..........Council on Environmental Quality

CFR...........Code of Federal Regulations

CFS...........Cubic Feet per Second

COE..........Corps of Engineers

DEC..........Department of Environmental Conservation (Alaska)

DOA..........Department of Agriculture

DOI............Department of Interior

EIS.............Environmental Impact Statement

EPA...........Environmental Protection Agency

FLPMA.....Federal Land Policy and Management Act

GVW..........Gross Vehicle Weight

ml/l............Milliliters per liter

NEPA........National Environmental Policy Act

NOI...........Notice of Intent

NPDES.......National Pollutant Discharge Elimination System

NRA..........National Recreation Area

NTU............Nephelometric Turbidity Units

NWR........National Wild River

RAMP.......Recreation Activity Managemtn Plan

RMIS...........Recreation Management Information System

RMP............Resource Management Plan

ROD...........Record of Decision

SHPO.........State Historic Preservation Officer

SNCA.........Steese National Conservation Area

SRMS.........Special Recreation Management Area

TSS............Total Suspended Solids

U.S.C..........United States Code

USGS..........United States Geological Survey

VRM............Visual Resource Management

WMNRA.....White Mountains National Recreation Area

WRC...........Water Resources Council

WRM..........Wild River Mile

WSRA........Wild Scenic River Act

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